WIRE AND WIRE PRODUCTS

JULY 1935

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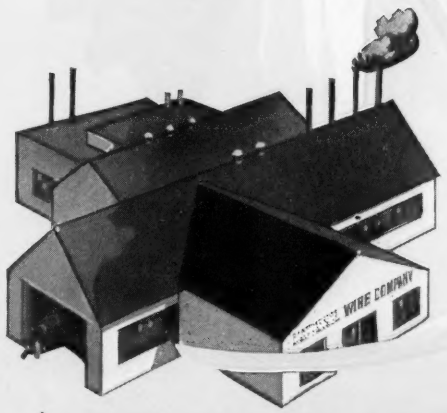

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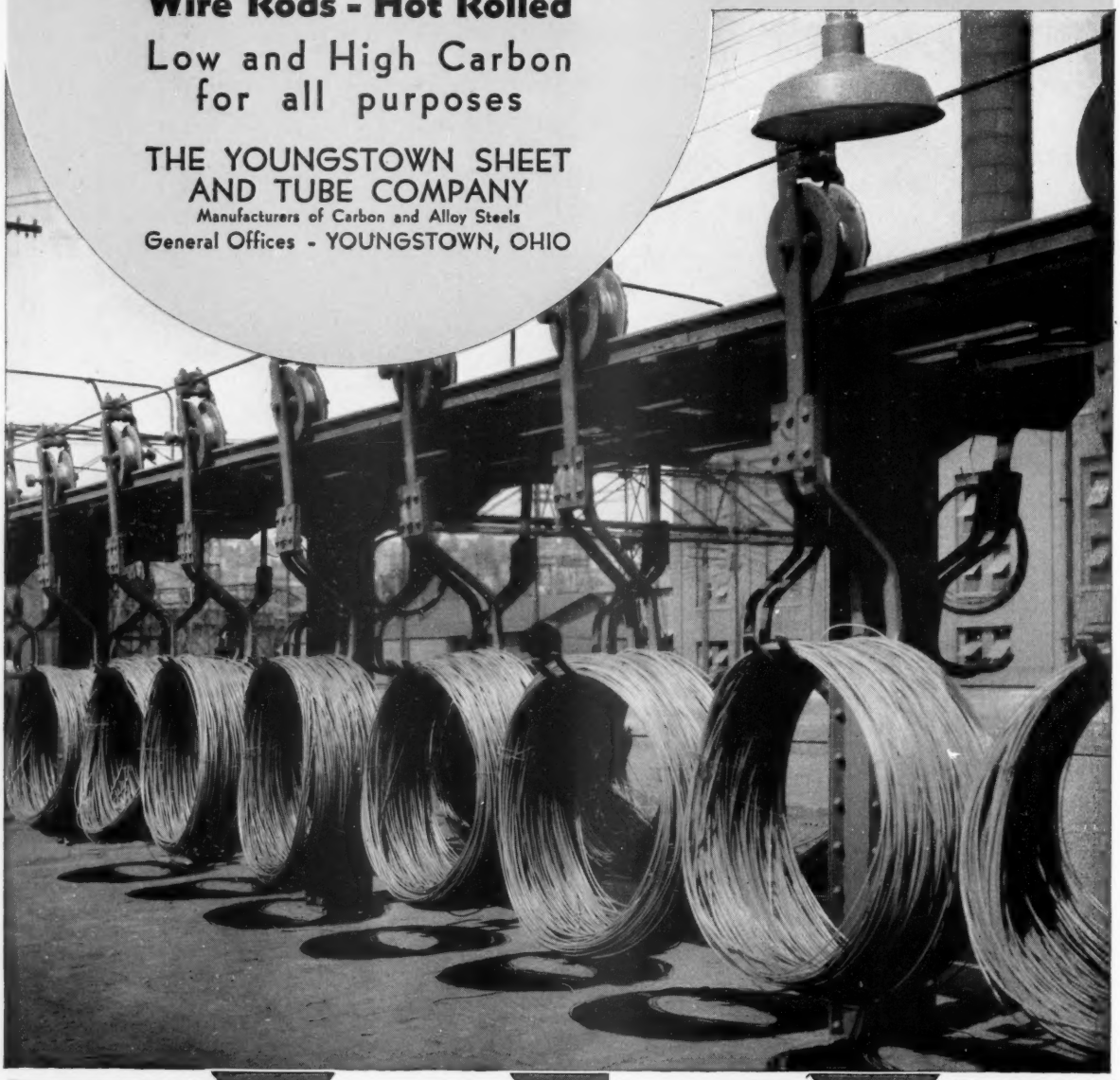

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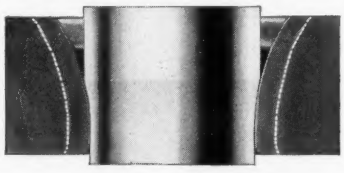

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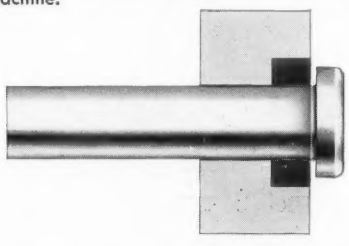

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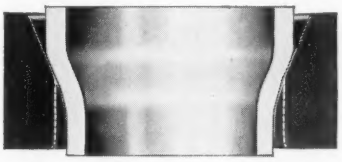

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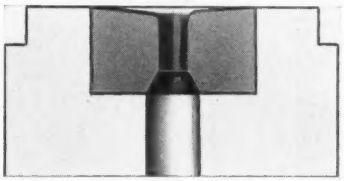

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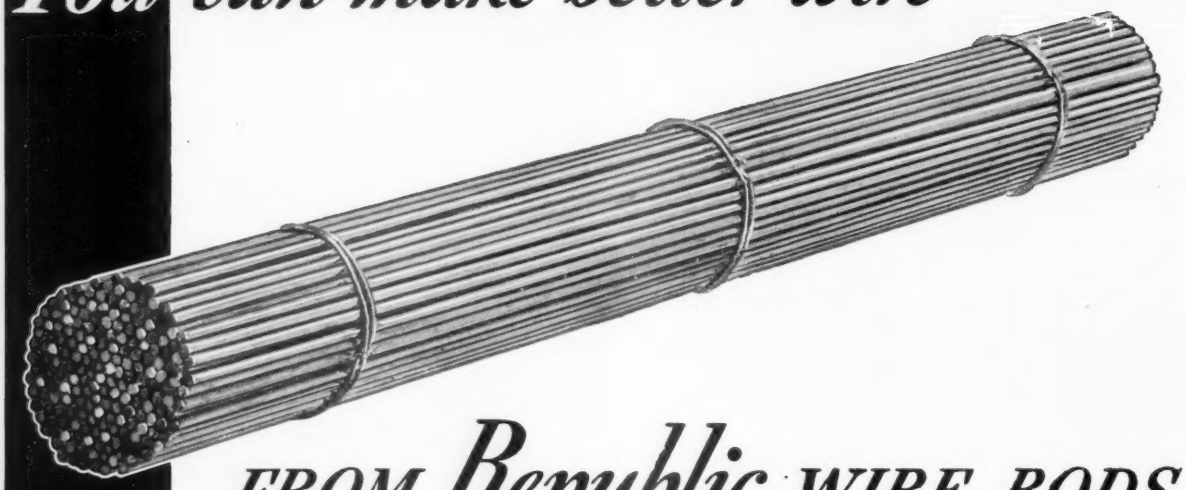

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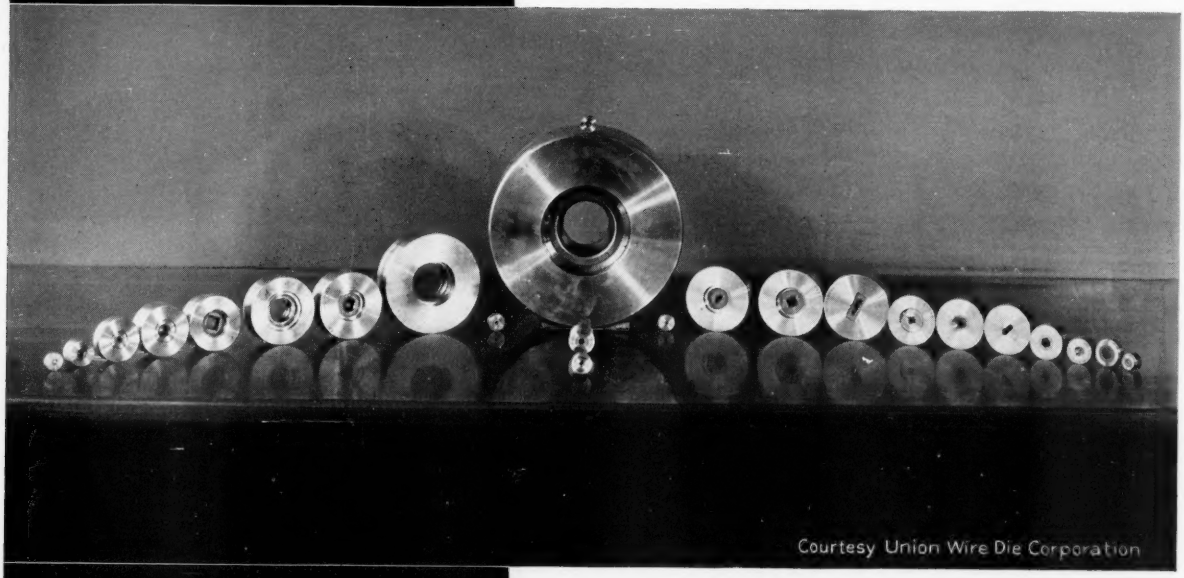
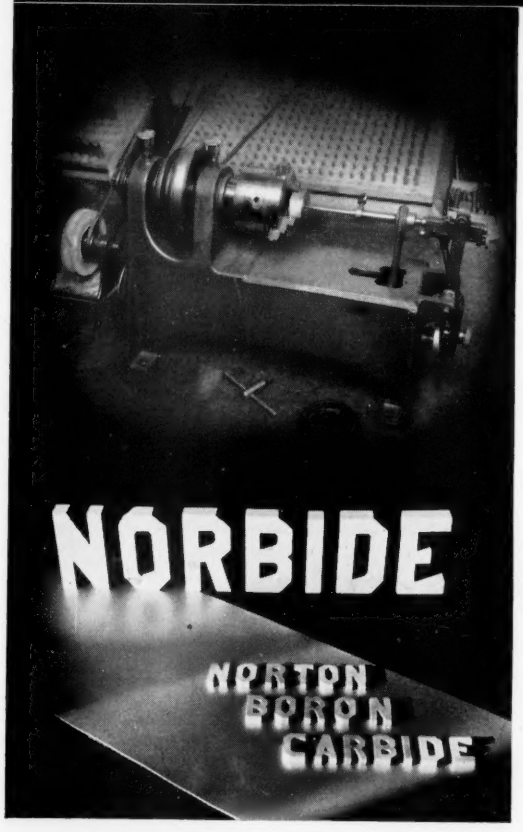


Courtesy Union Wire Die Corporation



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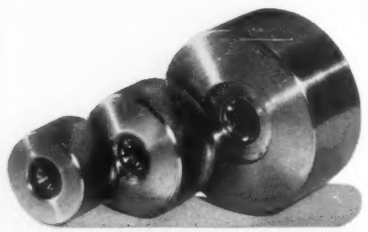

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WIRE AND WIRE PRODUCTS

Vol. 10 July 1935 No. 7

Designated as
Official Publication By The Wire Association

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Executive and Editorial Offices:
17 E. 42nd St., New York City. Telephone: Murray Hill 2-4188

Publication Office: Washington, N. J.
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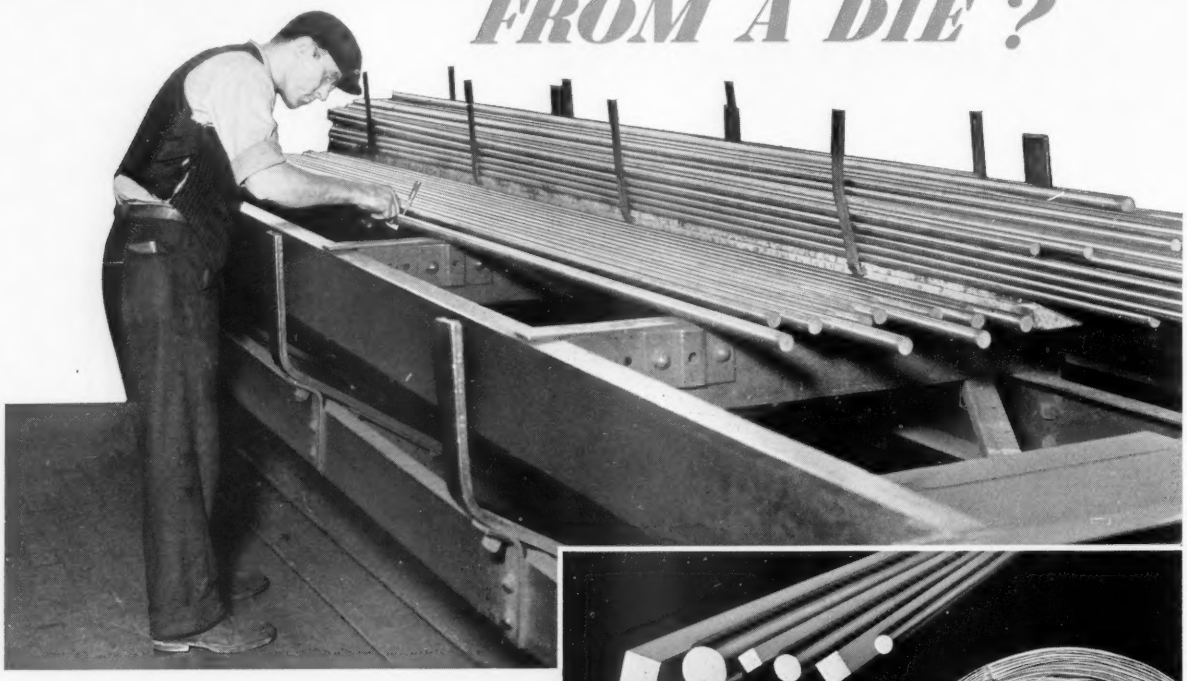

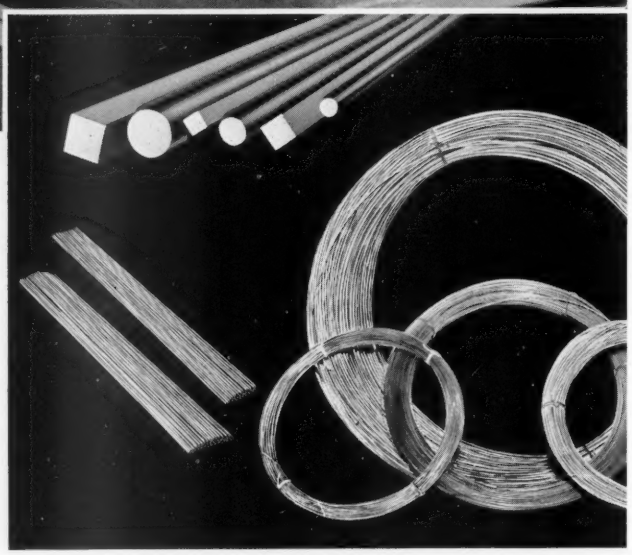

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WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip.
Wire Products and Insulated Wire and Cable.
DRAWING --- ROLLING--- EXTRUDING --- FORMING --- FABRICATING

Vol. 10 JULY 1935 No. 7

Rope Wire Cups, Bad Torsion and Fatigue

By Richard Saxton
Sheffield, England

The formation of cups or cuppy wire during manufacture traced to basic causes. These causes outlined and methods of production to remedy the conditions suggested. ✦ ✦ ✦

CUPS, or cuppy condition of high tensile rope wire, may be classed as the most serious defect to which this quality of material is subject, for while generally assumed to be due to faults in the ingot such as segregation, piping, etc., it is, in almost all cases, the result of negligent treatment during the process of manufacture.

✦ ✦ ✦

FOR segregated or piped material to reach the finished stage in high tensile drawing is practically impossible, the severe stresses to which metal must necessarily be subjected during cold working operation, quickly revealing any defective condition by fracturing the material immediately that pressure is applied to defective part.

✦ ✦ ✦

CUPS due to faulty condition of ingot or billet are easily recognised, the material at the point of fracture, revealing a coarse grain structure similar to that of axial segregation while those due to faulty methods of manufacture reveal a grain formation characteristic of good material.

✦ ✦ ✦

THE formation of cups or cuppy condition during manufacture can be traced to three sources; defective bearings; heavy drafting; and too rapid reduction; all inducing a brittle condition in which the cohesive qualities of the grain structure are impaired.

✦ ✦ ✦

Defective Bearings Set Up Cuppy Material

DEFECTIVE bearings, by causing restricted or irregular flow during drafting operations, set up a cuppy condition in the metal; the cross-sectional stresses introduced exerting a disintegrating action retarding the reducing effect, resulting in a condition in which the material is of no service.

✦ ✦ ✦

NARROW bearings, by restricting easy slips are a frequent cause of this fault. Easy slip is essential to efficient reduction and any retardation, whether due to narrow bearing or variable temper, results in brittle condition and consequent lack of elasticity.

WHERE conditions are favorable, as in an efficiently tubed or heat treated material, two kinds of slip take place during the passage through the die. There is first, the slip of the surface or outer section and, as this reaches a certain hardness under the pressure applied, a second and what is known as internal slip.

✦ ✦ ✦

THIS second slip converges, in cylindrical drawing, on the centre of the material and it is at this point where the pressure is greatest, that the grain structure undergoes the most severe elongation. Experiments conducted over a lengthy period indicate that the action of slip is to cause the crystals forming the structure to assume a virtually constant orientation.

✦ ✦ ✦

THE capacity of a steel to withstand the stresses generated by cold work, as in wire drawing, is to a great extent determined by the formation of the grain structure which, under pressure applied, is elongated into fibres. Flow takes place within the grain only, but movement at grain boundaries accompanies the internal flow, and this inter-granular movement is controlled by the uniformity of the flow.

Designated as Official Publication by the Wire Association

Heavy Drafting

HEAVY drafting, frequently employed as a means to raise a wire to a specified tensile test which, under normal drafting conditions it fails to achieve, is a further source of cuppy condition. The extra pressure applied, generally in the last or finishing draft when the material is in a hard state, has the effect of increasing the flow of the outer section beyond that of the internal, with resultant weakening of the cohesive properties of the grain structure.

✦ ✦ ✦

IT is this quicker flow of the external structure which brings about the peculiar cup formation in heavy drafting, the quicker movement setting up a disintegrating action which gradually permeates to the centre and causes fracture.

✦ ✦ ✦

THE general assumption is that the internal cupping produced by heavy drafting is due to the backward movement of the inner section, but this is an erroneous impression, the action of the pressure, due to peculiar formation of die bearing, permitting the core to pass while forcing outer section backwards.

✦ ✦ ✦

Too Rapid Reduction

TOO rapid reduction i. e. reduction at excessive speed, not only induces cuppy condition but in combination with the greater heat set up by the extra friction, quickly reduces the material to the overdrawn condition. Steel, whether subjected to cold work or heat treatment cannot be hurried without detriment to quality, and any increase of speed beyond that which experience has proved to be the recognised limit, results in defects rarely revealed until the material is tested in finished size.

✦ ✦ ✦

APPROXIMATELY 40 per cent of cuppy material produced in rope wire manufacture is due to heavy drafting following defective heat treatment, and the fact is often noted, before indicated by fracture, by the formation of minute cracks on the surface of the metal, running perpendicular to the length.

✦ ✦ ✦

CLAIMS have been made that this defect can be eliminated by prolonged heat treatment or annealing. This claim is wrong, for cuppiness is a severance or fracture of grain structure, and in heat treatment can only be eliminated by raising to a temperature at which other essential qualities are impaired.

✦ ✦ ✦

WHERE supposedly cuppy characteristics have been observed during drawing and the material has been restored to efficiency by annealing, it can safely be assumed that the defective condition was due to a too narrow bearing which, restricting uniform passage through the die, caused a fracture in the cup formation similar to what, at times, is observable in tensile testing.

✦ ✦ ✦

Bad Torsion

BAD torsion, a defect to which a fair amount of high tensile material owes its rejection, is chiefly the result of inefficient heat treatment. Axial segregation, heavy drafting, and too rapid reduction without rest intervals are also contributory, but only in a minor way.

✦ ✦ ✦

CONTRARY to general impression the torsion test is not for the purpose of indicating ductility, but for determining uniformity of quality. It is practically the most sensitive indicator of surface damage, for since torsinal strength varies with the cube of the diameter any surface damage affects the numbers of turns necessary to cause fracture. General opinion in the trade is that worn or corroded wires always reveal a greater reduction in the torsion than in the tensile test.

✦ ✦ ✦

AS stated earlier, the chief cause of this defect is inefficient heat treatment, i. e. lack of time for heat to soak, or change in grain formation to take place before being arrested by chill in cooling process. Pyrometers, indicating furnace temperature, perform a useful service, but it should not be overlooked that these indicate the temperature at the point of contact only, and that it is possible to have cold spots in the annealing chamber without their presence being indicated on the chart.

✦ ✦ ✦

Characteristic Methods of Locating Causes of Defects

A FAR better method of ascertaining the heat treatment to which the material is subjected is by examination of scale broken-off by a trio of pulleys through which the material is made to pass before winding on drum.

✦ ✦ ✦

IF of fairly even size the material has been normalised efficiently, but if of powdery, gritty nature, inefficient heat treatment is indicated and trouble can be expected on commencing drawing.

✦ ✦ ✦

TORSION test is a reliable indicator of heat treatment received. If, when the hand is passed across the torsioned section of the test piece the impression is that of a worn file, this indicates faulty treatment. Where efficiently normalised, the twists, while perceptible to the touch, will be found to be smooth.

✦ ✦ ✦

WHERE defection is due to heavy drafting or too rapid reduction, the test piece is an indicator of the cause. Material rendered defective during the drawing operation will snap with a decided ring and furnish a straight fracture, while that deficient in heat treatment will show a ragged fracture accompanied during disintegration by a tearing sound.

✦ ✦ ✦

WHERE the non-scaling method of normalising is practised, examination of the test sample after torsioning is recommended as a good indicator of heat treatment to which it has been subjected.

✦ ✦ ✦

THE practise of reversing high tensile wire in the last or finishing draft, a method rapidly fall-

(*Please turn to page 290*)

Testing Cable Sheath for Fatigue

By C. H. Greenall

Member of Technical Staff, Bell Telephone Laboratories, Inc.,
New York, N. Y.

The determination by laboratory methods for measuring the resistance of various cable sheathing alloys to fatigue, here described. ✦ ✦ ✦

AS a result of extensive engineering and manufacturing development work, lead-alloy sheathed cables have reached the stage where they provide one of the most dependable forms of communication channels. Their average life is now in excess of fifteen years which has only been obtained by a thorough scientific study along metallurgical and mechanical lines. After they have been in service for a considerable length of time, however, irregular cracks sometimes develop in the sheaths. Through these cracks, moisture, of course, can enter, and since the insulation of the conductors is dry paper, a small amount of moisture is sufficient to impair the transmission characteristics of the cable. These cracks differ from those that might result from a single application of a large stress, in that no deformation of the material is evident, and for the sheath alloys in general use—lead, lead-tin, and lead-antimony — the cracks follow the crystal boundaries. A failure of this kind is due to a condition called "fatigue", which results from repeated stressing of cable sheath over long periods of time. Stresses causing this type of failure in cable sheath arise from the swaying of the cable in the wind, from variations in air temperature —causing the cable to contract or expand—or from various types of vibration to which the cable may be subject. The cumulative effect of the long sequence of such stresses if they reach certain critical values ultimately results in intercrystalline fatigue failure of the sheath, although none of the individual stresses to which the sheath is subjected is, as a rule, great enough to cause immediate failure.

✦ ✦ ✦

CONSIDERABLE expense may result from such failures of cable sheath. The fault has first to be located and then repairs made which may result in considerable maintenance expense. It has been desirable therefore, to devise laboratory methods of measuring the resistance of various cable sheathing alloys to fatigue, so that the life of cables may be prolonged by improvement in the sheathing materials.

✦ ✦ ✦

FATIGUE failure in cable sheath, as in all other metals, frequently starts from a region of highly localized stress, such as is produced by a sharp bend or surface injury, and from these localized points may spread progressively through the sheath, resulting in ultimate failure. If, however, the stresses to which the sheath is subjected are below a certain limiting value, failure of the sheath either will not occur

or will be much delayed. This value is called the "fatigue endurance limit" and represents the maximum repeated stress to which the material may be indefinitely subjected without failure.

✦ ✦ ✦

THE development of laboratory testing methods to simulate service fatigue failures has been the subject of much study. The first investigations were made by bending full sections of the cable around a rather large radius, as shown in Figure 1. Sample lengths of cable, 9 feet long, were subjected to fatiguing action wherein one end of the cable was moved back and forth through a deflection of 2 inches, at a constant rate of approximately 96 bends per minute. This movement ultimately caused failure of the sheath at the bend due to fatigue. In order to record the time of failure of the sheath, the specimens of cable were sealed at each end and a slight vacuum was maintained in them. At the stationary end a connection was made to a mercury manometer. Failure of the sheath permitted air to enter and destroy the vacuum, causing the manometer to register the failure through an electrical connection. Failure in this test showed the same intercrystalline breakdown that is obtained in the field.

Fig. 1—One of the first types of fatigue testing machines which subjected full-sized cable to fatiguing action until failure occurred. ✦ ✦

✦ ✦ ✦

A SUBSEQUENT test was then developed which would not require as long a length of cable for the test, which resulted in considerable economy. In this test longitudinal sections of cable were held firmly at one end, while the other end was vibrated transversely ⅛ inch 1700 times per minute, thereby subjecting the sheath to alternate periods of tension and compression stress. This machine is shown in Figure 2. Here, again, the same method of determining sheath failure by means of a vacuum was used. An examination of the failures obtained compared to those being experienced in the field again indicated a similarity of type, namely, failure along the crystal boundaries, and showed the same appearance when examined microscopically.

✦ ✦ ✦

A FURTHER development in fatigue testing is illustrated by Figure 3. Here flat cantilever beam specimens are actuated by a rotating cam to varying degrees of deflection. The specimens for test are cross-milled from sheath which has been flattened prior to the machine operation, with considerable economy in the amount of material necessarily used for the test. Using this type of machine, more precise engineering data relative to the actual stresses in the material were obtained for the first time. Likewise, comparison of new alloys extruded in the laboratory in the form of tape, which were under consideration as possible sheath substitutes, could also be compared directly to the standard sheathing alloys. This also permitted correlation of the fatigue data being obtained during the test with the other physical properties of the sheathing alloys, such as tensile strength, hardness, and ductility.

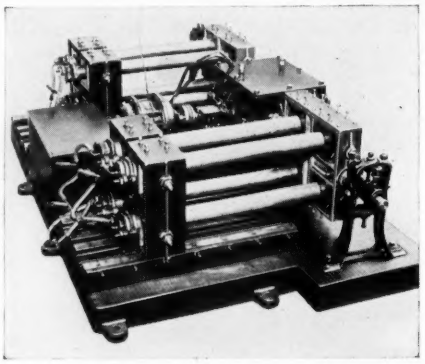

Fig. 2—Another type of fatigue testing machine which subjected sections of full-sized cable to fatiguing actions. ✦ ✦ ✦ ✦ ✦

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LABORATORY studies of the data which have been obtained on the three machines indicated the desirability of determining the fatigue characteristics of sheathing alloys throughout the entire range of stress to which the sheath might be subjected in the field. In the next machine designed, of the rotating cantilever beam type shown in Figure 4, alloy rods extruded in the laboratory could be loaded to any stress desired—the specimen being rotated under that stress until fracture occurred. Corresponding studies on the rod alloys for tensile strength, hardness, and ductility were then correlated to the fatigue data obtained on the rotating beam machine. A counting device on the machine permitted accurate determination of the number of reversals of stress to which each specimen was subjected until failure. In this

type of test each of the outer fibres of the specimens was subjected to successive cycles of tension and compressive stress.

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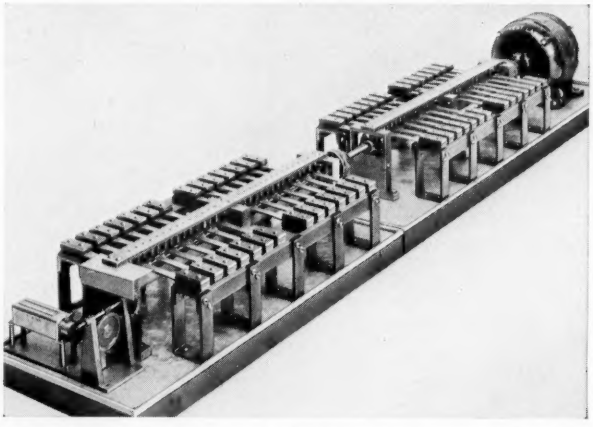
THE laboratory experiments had now reached the point where it was felt that various thicknesses and sizes of cable sheath should be extruded for experimental field installations. At the same time, it was realized that it would be desirable to be able to conduct laboratory tests on these various samples of sheath which were to be extruded for experimental test in the field. Accordingly, the latest type of fatigue testing machine, shown as Fig. A, was developed. Studies are now in progress of the fatigue characteristics of many alloys which have been under consideration for possible use as a cable sheathing material, all of which are being evaluated by using this type of machine. This machine has been found to be advantageous from the standpoint of economy of operation and the speed with which complete engineering data relative to the fatigue characteristics of the alloy may be obtained. One loading of the machine will supply sufficient data for the determination of the endurance limit and fatigue characteristics of the sheath at stresses comparable to those which occur in the field. The machine has a capacity of 126 fatigue specimens. Six reciprocating arms each having twenty-one specimen positions available, are adjusted so as to provide six different deflections. The deflections of each of the arms are chosen in such a manner that the fatigue endurance limit of the alloys, as a rule, will lie between the two smallest deflections used. In general, three specimens per alloy are used, which permit studies of seven alloys to be made on the fatigue testing machine at one time. The machine is designed so that the point of application of the bending force does not change as the reciprocating arms move back and forth. This avoids small changes in the free length of the specimen, which in previous designs have resulted in extraneous stresses being imposed upon the specimen, the value of which could not be definitely determined.



Rig. 3—An early type of fatigue test flexed sections of cable sheath back and forth till failure occurred. ✦ ✦ ✦ ✦ ✦

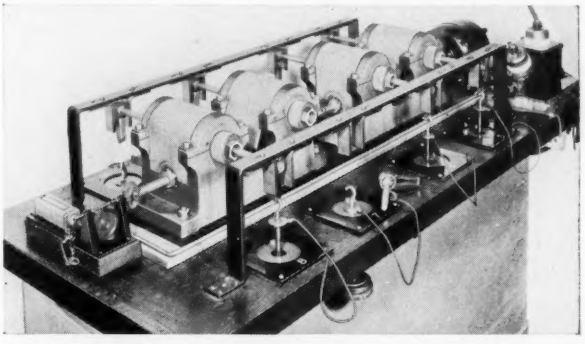


Fig. 4—A later type used rod form specimens which were rotated while sustaining a cantilever load. ✦ ✦ ✦ ✦ ✦

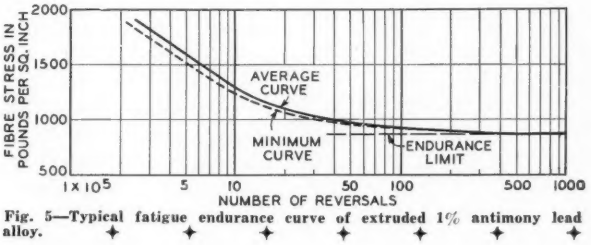


Fig. 5—Typical fatigue endurance curve of extruded 1% antimony lead alloy. ✦ ✦ ✦ ✦ ✦ ✦ ✦

EARLY in the investigation of fatigue characteristics of cable sheathing materials, it was realized that temperature had considerable effect on the fatigue characteristics of cable sheath. Temperature control has, therefore, been installed on the latest type of fatigue testing machines, the variations of the temperature being held to within ± 2 degrees Fahrenheit the average temperature being 85 degrees. Although this temperature is somewhat higher than standard room temperatures —68 degrees—the higher temperature is more economical and easier to control from an inspection standpoint. Variations in temperature from below zero to as high as 140 degrees are frequently encountered at locations where aerial cables are installed. For this reason, a temperature of 85 degrees was not considered seriously out of line with the average temperature to which sheath is subjected when exposed to the greatest fatigue conditions found in the field.

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THE latest machine was also developed primarily to permit the evaluation and testing of specimens at various thicknesses of cable sheath, as well as to permit allowance to be made for the fluctuation in sheath thickness or eccentricity which is noticeable around the circumference of cable sheath. Results which have been obtained have been correlated to the physical properties of the sheath and it is anticipated that ultimately these data will likewise be correlated with data obtained

(*Please turn to page 293*)

Diamond Dies

A history of the development of the diamond die together with an outline of methods of manufacture as compiled by the Association of Wire, Rod & Tube Die Manufacturers, Inc. Part II.

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IT is a matter of common knowledge that at one time all the diamond dies in use throughout the world were made in France and Switzerland. Even today these two countries can claim the manufacture of more than 50% of the diamond dies used in industry. Most of the diamond dies used in the United States are manufactured in whole or in part, in France and Switzerland. As a matter of fact only a few American Companies make their diamond dies completely within the borders of this country.

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THE technique of diamond die manufacture has for generations been developed by the French and Swiss so that it is reasonable that these countries continue to dominate the industry. There seems to be an inherent capacity in their workmen to produce articles requiring such skill and patience.

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IN the era just preceding the beginning of the twentieth century, the manufacture of the world's best watches and other timepieces was centralized in Switzerland and France. Today, however, under American precision production methods, the center of manufacture has shifted. The United States now produces watches as fine and, in the opinion of many, finer than those produced elsewhere. The genius of America has substituted machine skill for hand skill and in so doing has supplanted to a large extent the guess from manufacture.

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AS in watches, so in dies, the Americans have developed the manufacture of dies by machine methods. The diamond dies now produced in France and America are for all practical purposes identical. The French and Swiss, however, continue to be superior in the manufacture of extremely small dies. Machine work has not yet and perhaps never will supplant the rare skill and patience required to make dies as small as .00039. In these very fine sizes the work is still an art.

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Selecting Proper Diamonds

THE first step in making a diamond die is selection of the stone. It is not our purpose in this article to put forth the claims for superiority of any one stone over another. Manufacturers with long experience differ on this subject. Some use clear stones, others knotty ones. Some use harder stones, others use softer. Each, however, for reasons of his own, based on experience, has decided that a particular type and grade of stone is best suited for the work which he expects his dies to do. Because the labor which goes into the manufacture of a die is expensive, each manufacturer selects stones, attempting to reject in his purchase, those stones which have obvious flaws, such as carbon spots, cracks, internal pits, etc. The fact that during the course of manufacture the average rejections which all manufacturers experience, run as high as 20%, indicates how difficult it is to select perfect diamonds in their rough state.

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Lapping The Diamonds

THE second step in diamond die manufacture is the lapping of the diamonds by a mechanical process to produce two flat sides on the top and bottom surfaces of the stone. When the flats have been lapped, the stones are again subjected to an inspection and at that time, if there are any apparent flaws, the dies are rejected. This is simply a precautionary measure. It enables the die manufacturer to save labor by rejecting dies, which during the lapping process have shown that subsequent work will develop flaws. Besides being useful as a means of inspection, the lapping was originally undertaken to aid the die manufacturer to set his stones squarely. This squaring of the stones provides a section into which an entrance of die shape can be made, so that entrance angle will have the appearance of a uniform cone. There are some manufacturers who do not lap the top surface because they feel that it robs the diamond of some of its value in weight and the entrance of its funnel. These manufacturers drill the diamond in its natural state. When this method is used, it may be that the cone of entrance will appear to be high sided. What actually has occurred, is, that since the diamond is of irregular shape when the drilling operation takes place, there being more diamond on one side than on the other, the entrance cone actually has greater length on one side than on the other. No advantage one way or the other seems to accrue by the use of either method.

BOTH schools of manufacture, the European and the American, do the same work up to this point. From then on the practice differs somewhat because, as stated previously, the American manufacturer uses more machines while the European employs more handwork.

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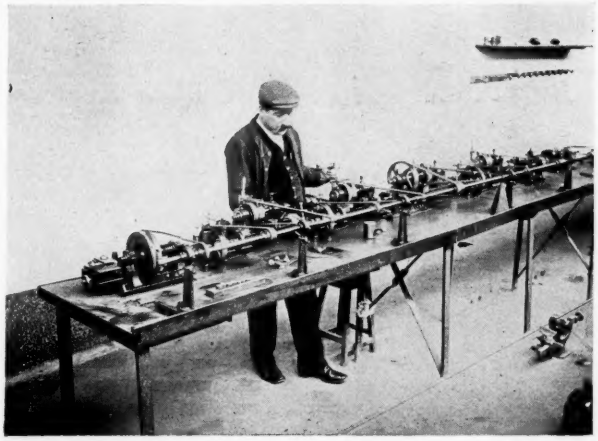
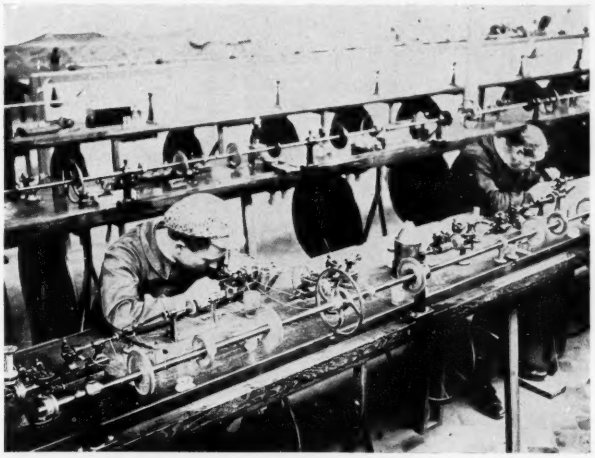
European and American Methods Contrasted

THE European manufacturer does not permanently set his diamond in the early stages of his work. Rather the diamond is set in jeweler's shellac or lead and the spotting, pointing, drilling, and subsequent processes are carried on while the diamond is so supported. American manufacturers, as a rule, set the diamond in whatever casing they may finally use and do their spotting, pointing, drilling, etc., while the die is already in its final casing.



Flattening Diamonds Before Drilling. Courtesy Vianney Wire Die Works.



Finishing Fine Wire Drawing Diamond Dies. Courtesy Vianney Wire Die Works.

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THE operations following the supporting of the diamond are as follows: spotting and pointing, drilling, ripping, shaping, polishing, and finishing. The spotting and pointing is effected by placing the diamond nib in a chuck which revolves at high speed, centering the diamond so that wherever an indentation is to be made it shall be in that portion of the diamond which gives the greatest transverse strength, taking a piece of crushing boarts with a sharp cutting edge, holding the boarts in a pair of pliers or other tool, and pressing it against the face of a diamond until an indentation is made. When this indentation is sufficiently deep (the depth of this indentation is established by experience and the type of die required), the operator takes a piece of diamond known as a splint or engraver's point and in the center of the bottom of the indentation makes a very narrow small depression. This entire process is repeated on the back of the die When this operation has been completed, the die is again subjected to inspection to determine whether internal flaws have developed. If there are no flaws the die is then moved on to the further work of drilling.

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Drilling The Diamond

DRILLING is an operation which, as its name implies, drills a hole through the die, bringing it close to size. A tapered needle charged with diamond powder, revolving at high speeds and employing a reciprocating motion, is used. Upon completion of the drilling operation the die is again inspected for flaws and if there are none found it is passed on to the work of ripping which consists of using the same mechanical equipment as the drilling operation, except that a straight needle is used. The ripping continues until the die is within .001" from its finishing size. The die has now assumed more of its finished appearance, that is, it has a rough opening at the top and a straight hole through the bearing and a rounded back. The die now must be shaped for the different types of material that it has to draw. For copper, a radial or parabolic shape is employed with greatest success, while for the drawing of steel, a definite angle rather than a radial reduction area is used. Again the American process differs from the European in that the shapes in the United States are produced by a machine whereas in France, they are effected by skilled handwork. Shaping is usually done by holding a fine splint or engraver's point in a pair of pliers and cutting the definite shape in the diamond while it is revolving at high speeds.

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Polishing and Finishing

WHEN the required shape is in the die there remains only the polishing and finishing of the diamond which is generally done by machine, no matter whether it is done in the United States or in France. The polishing is a slow, drawn out proposition at best. Some manufacturers are known to employ machines which take as long as two weeks to polish a die especially one of the larger sizes, whereas other manufacturers claim to have equipment which will produce the same effect in a matter of hours.

(*Please turn to page 296*)

Fatigue-Testing Machine For Wire

THE Haigh-Robertson fatigue testing machine for wire, designed by Professor Haigh of the Royal Naval College, Greenwich, and Mr. T. S. Robertson, and first publicly exhibited at the Conversazione of the Royal Society, London, in 1933, has been redesigned to incorporate improvements suggested by experience gained in practical testing, and is now being manufactured by Messrs. Bruntons' Ltd., Musselburgh, Scotland.

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IN a machine intended for fatigue tests on wire, it is, of course, necessary for the stress and strain at the fracture to be accurately measurable and for the method of gripping and loading the wire not to affect the results of the test. In the Haigh-Robertson machine this has been done by gripping and loading the specimen in such a manner that the fracture occurs at mid-length, in a part remote from the grips. The sample is also tested with the hard-drawn skin intact as the wire comes from the die, or it may be galvanised or plated, rusted or injured, or treated with a preservative or corrosive agent, as desired. Thus the complete section of the wire is tested in bending under conditions reasonably comparable with those encountered in service, and the type of fracture obtained is the same as occurs in practice.

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THE principle of the test is illustrated in Figs. 1 and 2; it will be seen that one end of the wire is gripped in a chuck while the other runs in a special form of ball thrust bearing. The latter is moved towards the chuck to bend the wire into the form illustrated and the chuck, together with the small driving motor, turns about an axis coincident with the ends of the chuck jaws. The use of the ball thrust bearing and the fact that the chuck and motor turn about a vertical axis ensures that the wire bends in a horizontal plane under the action of two equal and opposite forces, F in Fig. 2, acting along the line AB. The bending moment and curvature of the wire vary along its length, being greatest at mid-span where the deflection Y is greatest. The sample is kept rotating until it breaks by fatigue, fracture occurring, as already stated, near mid-span. The speed of rotation is such that about 20,000,000 cycles are passed through in 24 hours, but higher speeds, up to 28,000,000 cycles, can be employed for wires of small gauge. It should, perhaps, be pointed out that the wire does not "whirl" about the line AB, but rotates about its own curved axis of flexure in a manner similar to a flexible shaft. At first sight the wire appears to be at rest although actually it is rotating at high speed.

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A PHOTOGRAPH of the machine is reproduced in Fig. 3, and a longitudinal section and plan are given in Figs. 4 and 5, respectively. It is mounted on a bedplate resembling a lathe bed, the headstock being represented by the driving motor and chuck and the tailstock by the ball thrust bearing. The position of the tailstock can be adjusted to take specimens ranging from 3½ in. to 30 in., in length. Actually the headstock is supported on a casting bolted to one end of the bedplate, and is carried by a spring-mounted sapphire at the top and guided by ball bearings at the top and bottom, as will be clear

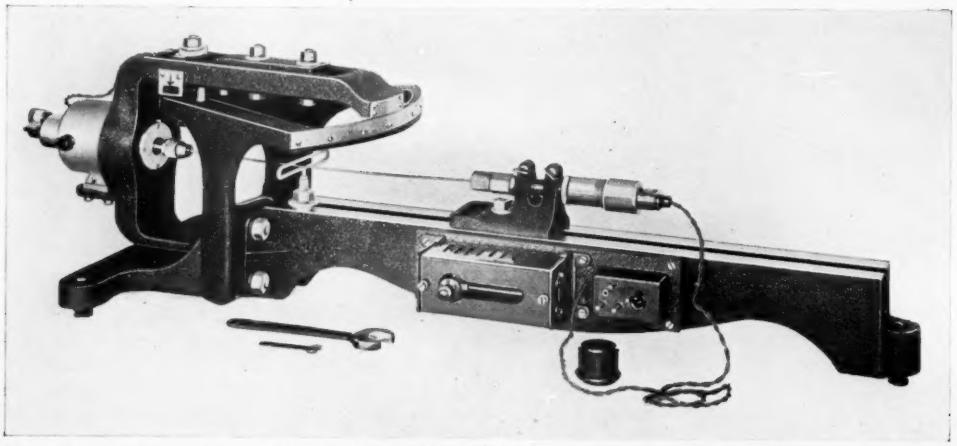

Figure 3.

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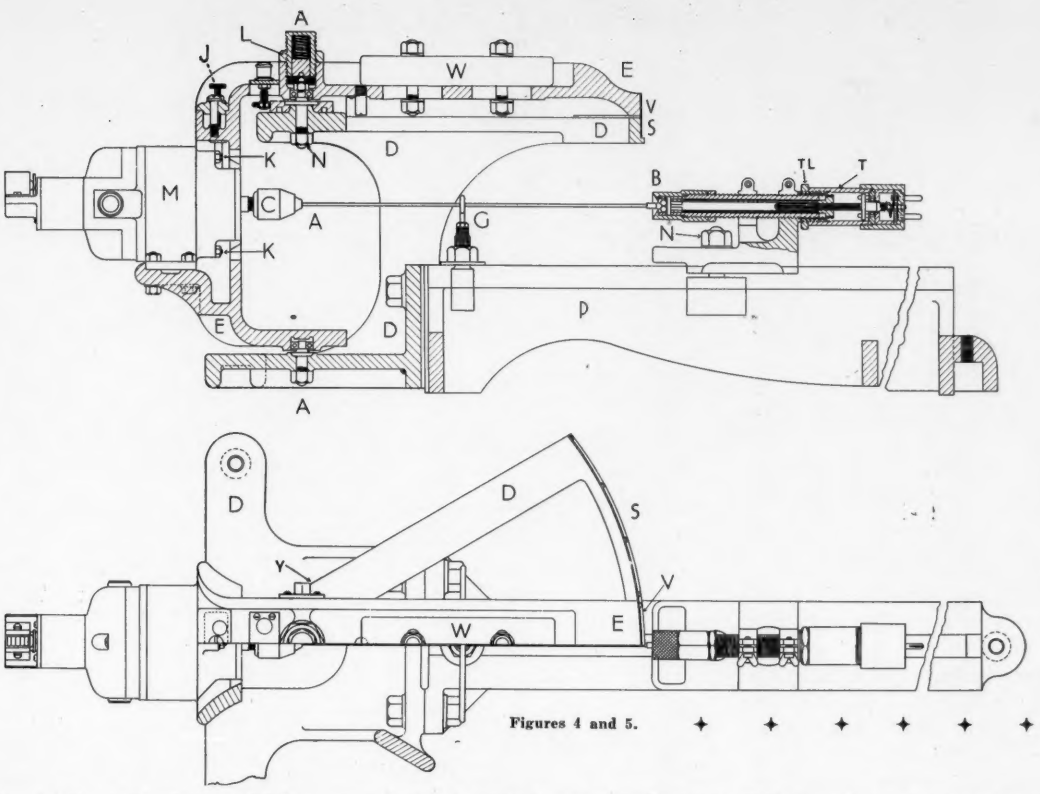

Figures 4 and 5.

from Fig. 4, the axis about which [illegible] passing through the chuck jaws, as already mentioned. An adjustable balance weight is fitted to the headstock, as clearly shown in Fig. 4, to eliminate any error in the vertical setting of the axis. The casting on which the headstock is supported is provided with a scale and, by means of a vernier attached to the headstock, the angular position of the latter can be read with sufficient accuracy. It should be noted that the headstock adjusts itself automatically by the flexure of the wire as the tailstock is brought towards it.

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IT will be seen from Fig. 4 that the tailstock is clamped to the bed by means of a single bolt, the degree of flexure of the wire specimen being adjusted by means of a horizontal screw turned by a knurled head. The thrust bearing in the tailstock, shown in Fig. 7, is of a particularly simple type. The thrust exerted by the wire is transmitted through a tapered sleeve fitted on the end of the wire to a 5 mm. ball which runs on three balls of the same size. These three balls run inside a hardened steel race and press against a disc of hardened steel a small clearance being left between the disc and the ball race as shown in Fig. 7.

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WHEN the specimen breaks, this disc is moved forward by the action of a spring plunger which is followed by a spring switch in the circuit of the motor. Thus the motor, and the revolution counter connected to it, are stopped. A cap is fitted to prevent the three balls from falling out. A guard, in the form of a loop, best shown in Fig. 4, is fitted 'round the specimen to restrict the whirl of the latter after breaking, but this guard is quite clear of the specimen during the test. The machine can be run satisfactorily on any stout table. Its feet are supported on springs which serve a dual purpose, eliminating both incoming and outgoing vibrations.

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REFERRING again to Fig. 4, it will be seen that the headstock is provided with an oil reservoir and sump for the lubrication of the main ball bearing of the motor. This bearing, which takes the considerable thrust of the specimen, is provided with drip-feed lubrication. The motor, which is of about 1/10-h.p., is of the universal type, and can be used on either alternating-current or direct-current circuits. It normally runs at about 14,000 r.p.m., but the speed is regulated by a series resistance attached to the bedplate, as shown in Fig. 3. The speed counter is interesting. It is of the Veeder type, but is driven through a flexible coupling and a Synclock reduction gear having a gear ratio of 3,000: 1. The counter records thousands of revolutions, and having five figures, repeats after counting 100,000,000.

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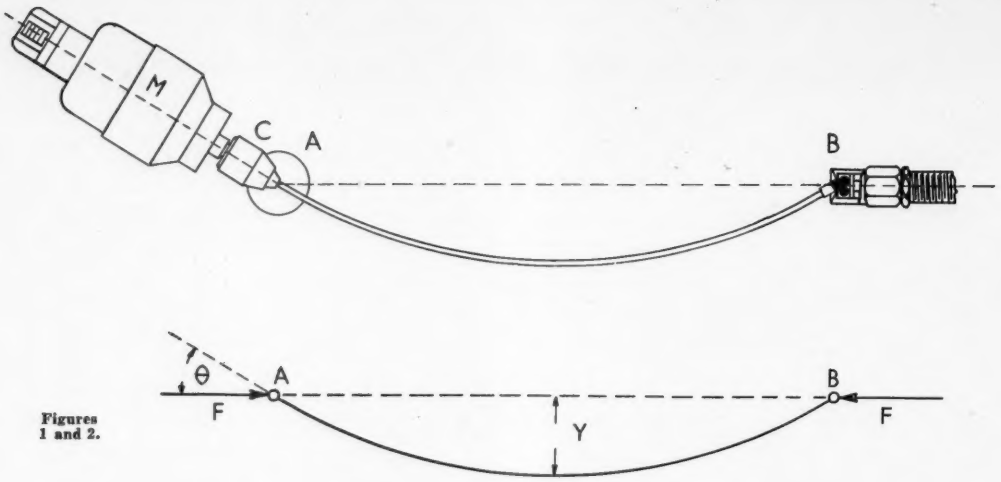
TO prepare a specimen for testing, one end is ground to fit the taper in the sleeve that engages with the centre ball of the tailstock bearing, previously referred to, and after the sleeve has been fitted the wire is cut so that its length is $\frac{9}{16}$ in. greater than 150 diameters, the length being measured from the centre of the 5-mm. ball. The specimen is then inserted in the chuck, and the other



Figures 1 and 2.

end having been inserted in the tailstock bearing, the tailstock is locked in position on the bedplate and the knurled end of the tailstock screw is turned to load the specimen and cause it to flex slightly. This will cause the swinging headstock to turn through two or three degrees. The motor is then started and the specimen is steadied by hand as the speed increases, until it has passed through any critical range. The knurled head on the tailstock is then turned, so that the thrust-bearing moves farther in, and the headstock turns through a greater angle, the follow-up arm being adjusted, as mentioned above, to prevent any torque from being applied by the electrical connections. When the tailstock bearing has been advanced to the correct position, two wing nuts, shown in Fig. 5, are tightened up to clamp it in position.

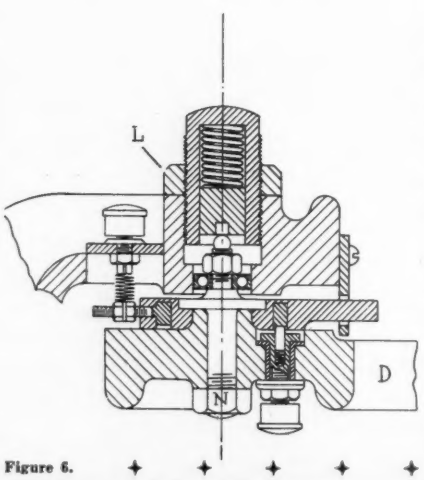


Figure 6.

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TO calculate the angle θ, Fig 2, five formulæ have been worked out by the designers. Where it is required to bend the wire to a known radius of curvature R, the relationship $\theta = 18{\cdot}237\ L/R$ may be used, L being, of course, the length of the specimen. Again, when it is desired to obtain a certain degree of bending strain e, without reference to the stress, the formula $\theta = 36{\cdot}475\ e\ L/d$ may be employed, d being the diameter of the wire. A general formula applicable to all materials of known elastic modulus E is $36{\cdot}475\ f/E \times L/d$ where f is the bending stress. For cases in which $L/d = 150$, the formula $\theta = 5471\ f/E$ may be convenient, and the fifth formula is $\theta = 0{\cdot}4412f$. This last formula is only applicable for $L/d = 150$, and for steel in which $E = 12{,}400$ tons per square inch. The angles calculated as above are a little too large, for a reason which will be explained later, and a table is given with the machine, showing the amount to be subtracted. This, it may be noted, only amounts to 0·17 deg. when the calculated angle is 30 deg. It is to be noted that stresses, including modulus of elasticity, are given in tons (2240 lbs.) per square inch.

THE theory of the test may be explained thus: The specimen under test corresponds to an Euler strut, and the flexure is approximately in the form of a sine curve, having an equation $y = Y \sin \pi\ (x/L)$ where Y is the deflection at mid length for a test-piece of length L and y is the deflection at a distance x from one end. The inclination and curvature are given by

$$i = \frac{dy}{dx} = + \frac{\pi Y}{L} \cos \pi\ (x/L) = \theta \cos \pi\ (x/L)$$

and

$$\frac{1}{r} = \frac{d^2y}{dx^2} = - \frac{\pi^2 Y}{L^2} \sin \pi\ (x/L) = - \frac{\pi\theta}{L} \sin \pi\ (x/L)$$

where θ is the inclination at the chuck end as measured by the vernier fitted to the swinging headstock. The greatest curvature is at mid-length, and is given by $\frac{1}{R} = \frac{\pi}{L}\theta$ where R denotes the corresponding least radius of curvature. Then bending strain e at

(*Please turn to page 284*)

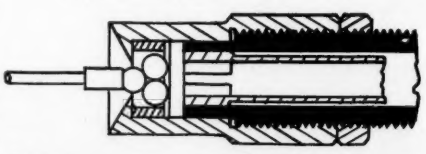

Figure 7.

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The Wire Association
1935 Meeting and Exhibition

At Chicago, Ill., September 30; Oct. 1, 2, 3, 4, 1935

In Association With the National Metal Congress

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✦ ✦ ✦

THE Wire Association serves as a technical society interested in the purely technical problems concerning the wire industry. The membership includes:

1. Manufacturers of wire, rod, strip, cold drawn shapes and tubing.
2. Users of wire—Manufacturers and fabricators of wire products.
3. Manufacturers of machinery and supplies pertinent to the wire industry.

✦ ✦ ✦

IN addition to the program of research papers set forth, a splendid opportunity is offered to discuss informally, routine problems and to exchange opinions and ideas regarding equipment and processes used in the industry. For this purpose informal gatherings are held at Wire Association Headquarters in the Hotel Congress which are open from 9 A. M. to 11 P. M., during the convention.

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FOR the first time one entire session will be devoted to open discussions of the joint problems of users of wire and the manufacturers of wire who supply them. It is expected that an interesting meeting covering many practical problems common to both will result.

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Every wire mill production executive engaged in the manufacture or fabrication of wire and wire products of any kind is invited to join the Wire Association and attend these meetings.

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Monday, September 30, 1935 at Hotel Congress

A. M.—Registration—"Get Together"

P. M.—Directors' Meeting—Program Committee Meeting

Annual Meeting of The Wire Association

✦ ✦ ✦

The Technical Sessions

TUESDAY, WEDNESDAY AND THURSDAY, OCTOBER 1-2-3, 1935

(All Research Papers Will Be Reprinted in the September Issue of Wire and Wire Products)

THERE WILL BE A REGISTRATION FEE OF $5.00 FOR THOSE ATTENDING THESE TECHNICAL SESSIONS AND INFORMAL MEETINGS

ADMISSION WILL BE BY BADGE ONLY

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The Following Papers Will Be Presented and Open Discussions Held on The Topics Covered

Paper:—Acid Cleaning and Material Handling of Rods and Wire

By Frederick A. Westphal, Superintendent, Wire Mill
Sheffield Steel Company, Kansas City, Mo.

A discussion of the factors controlling the proper cleaning and pickling of rod and wire combined with more efficient methods of handling the material throughout the plant.

✦ ✦ ✦

Paper:—Grain Size and Its Influence on the Manufacture of Steel Wire

By B. L. McCarthy, Metallurgist
Wickwire-Spencer Steel Co., Buffalo, N. Y.

Material for this paper is the result of an exhaustive study made by the Wickwire-Spencer Steel Company. This paper, while embracing the Inherent or McQuaid-Ehn Grain Size, is broad enough to cover both the Austenitic Grain Size (which is the Grain Size considered when the terms Inherent or McQuaid-Ehn are used) as well as the actual Grain Size, which is the product of hot rolling, patenting, annealing, etc.

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Address:—"Industrial Relations as Applied to the Wire Industry"

By E. W. Kempton, Director of Industrial Relations
American Steel & Wire Co., Cleveland, Ohio

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Paper:—"Cold Heading Wire"

By L. D. Seymour, Metallurgist
Youngstown Sheet & Tube Co., Youngstown, Ohio

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Paper:—"Tests and Testing"

By C. A. Kellogg, Metallurgist
Continental Steel Corp., Kokomo, Ind.

Paper:—Modern Acid Handling Methods Lower Pickling Costs

By J. R. Hoover, Assistant Manager, Chemical Sales Division
The B. F. Goodrich Co., Akron, Ohio

An entirely new point of view has been developing in recent years with respect to methods of handling acid in the pickling of steel. It is gradually being recognized that acid leakage, hazardous working conditions and frequent shutdowns for repair can and should be eliminated;—to the point where pickling reaches a degree of efficiency comparable to that of other steel mill operations. Some of the improvements in equipment and methods which are responsible for this new point of view will be described, with emphasis upon lower cost per ton of pickled steel.

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Paper:—The Effect of Grain Size on the Physical Properties of Copper in Drawing and Annealing

By Dr. L. B. Barker, S. M., Metalographer
General Electric Research Laboratories
and A. E. Bailey, in Charge of Testing Laboratory,
Wire Dept., General Electric Company, Schenectady, N. Y.

Dr. Barker has been spending all of his time for the past six months on copper investigation in direct connection with manufacture. Mr. Bailey has been making laboratory tests and developing means for testing the materials in conjunction with Dr. Barker. The results of the work so far indicate that there is a distinct relation between grain size, Rockwell hardness, resistance to bending, or so called springiness, and that there is not nearly as close a relationship between these things and elongation and tensile strength as has been usually supposed.

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Paper:—Hard and Soft Copper Wire

By Rudolph A. Schatzel, Superintendent, General Reasearch Laboratories
General Cable Corp., Rome, N. Y.

TENTATIVE OUTLINE

I. General Principles.
   1. Casting and Recrystallization from Molten Bath.
   2. Hot Working—Recrystallization—Eutectic Distribution.
   3. Cold Working—Drawing—Rolling—Effect on Grain Size; Mechanics of Slip; Effect on Physical Properties.
   4. Annealing—Definition. Effect of Cold Working on Temperature; Effect of Impurities; Effect of Temperature on Grain Size.

II. Applications of Principles to Practice
   1. Wire Bar—Interpretation of Micrographs of Structure—Oxide Distribution.
   2. Hot Rolled Rod—Structure and Refinement of Crystal size.
   3. Cold Drawing—Fibring—Slip Planes—Uniformity of Working Throughout Cross-Section—Hardening Effect of Drawing Schedule on Grain Size.
   4. Cold Rolling—Brief Mention Only.
   5. Annealing—Recrystallization; Direction of Working; Effect of Annealing and Drawing Schedules on Grain Size.

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SPECIAL MEETINGS

BRAIDING AND WIRE COVERING MACHINE MANUFACTURERS' ASSOCIATION MEETING.

(Admission to session only by card furnished by member companies of the Braiding and Wire Covering Machine Association or by Wire Association Registration Badge.)

At this meeting, three papers relating to insulating, braiding, covering and the manufacture of electric wire will be presented by members of this association.

This will be a joint meeting with The Wire Association. No registration fee required for attendance. All wire men interested in these subjects are invited to be present.

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CUSTOMER RELATIONS

(Admission to this session only by card furnished by members of the Wire Association or by Registration Badge.)

This session to be devoted to open discussions of the joint problems of the users of wire, manufacturers and fabricators of wire products and the manufacturers of wire who supply them.

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Informal Dinner of The Wire Association

Wednesday, Oct. 2, 1935

Walter A. Richards, Chicago, Ill.
Chairman of Dinner Committee
Award of The Wire Association Medal

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It Will Pay You To Attend These Meetings and Visit The National Metal Exposition!

Outstanding Personalities of the Wire Industry

William Haddow Dead

IT is with extreme regret that we annnounce the death of **William Haddow** of Ossining, New York, one of the members of the Wire Association and a man well known to the wire industry for his many inventions in connection with wire mill machinery and die polishing equipment.

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MR. **Haddow** was born in Ayr, Scotland, June 17, 1861, and came to St. John, New Brunswick, as a small child. He came to Boston at about the age of eighteen. He married Isabel Batchelor, formerly of St. John, New Brunswick, on December 26, 1881. Sometime during 1898 he and the Stanley Brothers of Newton, Massachusetts, built the Stanley Steamer. In the latter part of 1899 the Stanley Brothers sold their business to John Brisbane Walker, editor and publisher of the "Cosmopolitan" magazine. Mr. Walker sold half his interests to Mr. Amzi L. Barber, who started the Locomobile Company of Bridgeport, Connecticut, and Mr. Haddow came to Tarrytown, New York, with Mr. Walker and continued the manufacturing of steam cars under the heading of Mobile Company of America. He built the original building of what is now the Chevrolet plant. During this time he invented the original automobile brake which held a revolving shaft in either direction, the outcome of which is the present-day automobile brake. In 1902 he went into business for himself in Ossining, New York, under the heading of Hub Foundry and Plating Company, specializing in automobile castings. From then on, for several years he was connected with the Hudson Wire Company, in the designing and building of special wire-drawing machinery. He invented and patented a machine which is entirely different from anything on the market for polishing diamond dies for wire-drawing. The last four years he spent experimenting with and selling these machines. Among

WILLIAM HADDOW

other things he invented were soap dispensing machines for delivering soap in liquid or powder form, such as are now used in public wash rooms, hotels, and pullman trains.

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MR. Haddow is survived by his wife and one son, George W. Haddow, who at the present time is connected with the Hudson Wire Company of Ossining, New York.

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Walter L. Tann Joins Farrel-Birmingham

TO his new post Mr. Tann brings a diversified experience in various phases of mechanical engineering and industrial management, acquired in several lines, particularly on heavy hoisting, material handling and hydraulic machinery.

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BORN in Troy, N. Y., he attended the public schools of that city, and received his engineering education in the Student Engineers' School of the American Locomotive Company at Schenectady, N. Y. From 1915 to 1918, he was employed by the General Electric Company on the mechanical design of electric drive for steel mill roll drives, and during the war, on the design of submarine boat drives.

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FOLLOWING that period he was engaged for three years as Assistant Chief Engineer for the Watson Products Corporation. Since then, he has been associated with the Link Belt Company, and the Philadelphia Gear Works, and for the past eight years has been Executive Engineer for the engineering firm of Peter Clark, Inc., of New York City.

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MR. Tann is a Member of the American Society of Mechical Engineers, in which organization he is a member of the Executive Committee of the Metropolitan Section and a member of the Committee on Industrial Marketing. He is also a member of the American Society of Naval Engineers.

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L. Douglas Smith Now Vice-President of Lewis Foundry & Machine Co.

L. Douglas Smith has been elected vice president of the Lewis Foundry & Machine Co., Coraopolis, Pa., succeeding Jan. R. Dunsford.

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Dr. Irving Langmuir Honored

THE Holley Medal for 1934 was awarded on June 20, at the semi-annual meeting of the American Society of Mechanical Engineers at Cincinnati, Ohio, to **Dr. Irving Langmuir**, associate director of the General Electric Research Laboratory, for his contributions to science and engineering, especially in the development of the gas-filled incandescent lamp, of the thoriated filament for thermionic emission, of atomic-hydrogen welding, of phase-control operation of the Thyratron tube, and in fundamental research in oil films.

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THE Holley Medal was instituted and endowed in 1924 by George I. Rockwood, past vice-president of the A. S. M. E., to be bestowed for some great and unique act of genius of engineering nature that has accomplished a great and timely public benefit. It was awarded to Hjalmar Gotfried Carlson in 1924; to Elmer Ambrose Sperry in 1928; and to Baron Chuzaburo Shiba in 1929.

FIRTHALOY OPENS NEW CHICAGO PLANT WITH "HOUSE WARMING"

"OPEN House" was held by the Firthaloy Division of the Firth-Sterling Steel Company on Saturday, June 29th, at 710-714 West Lake St., Chicago, Illinois, in connection with the opening of their new Chicago branch plant.

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A LARGE number of wire men from the midwestern States were present to inspect the plant, which has been established to provide adequate manufacturing and servicing facilities for their constantly expanding die business in this area.

THIS plant will give service on a twenty-four hour basis seven days a week on all types of special dies.

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THE equipment is of the latest type built to special designs developed by the Firthaloy engineers and is adequate to handle all demands promptly.

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THE plant layout is compact and effective, being designed to eliminate all waste effort and many favorable comments on these features were made by the inspecting visitors.

THE proceedings started early in the day. Each visitor was "personally conducted" and given a detailed demonstration of Firthaloy methods of manufacturing and servicing dies, then introduced to his fellow visitors and the "get-together" was on its way.

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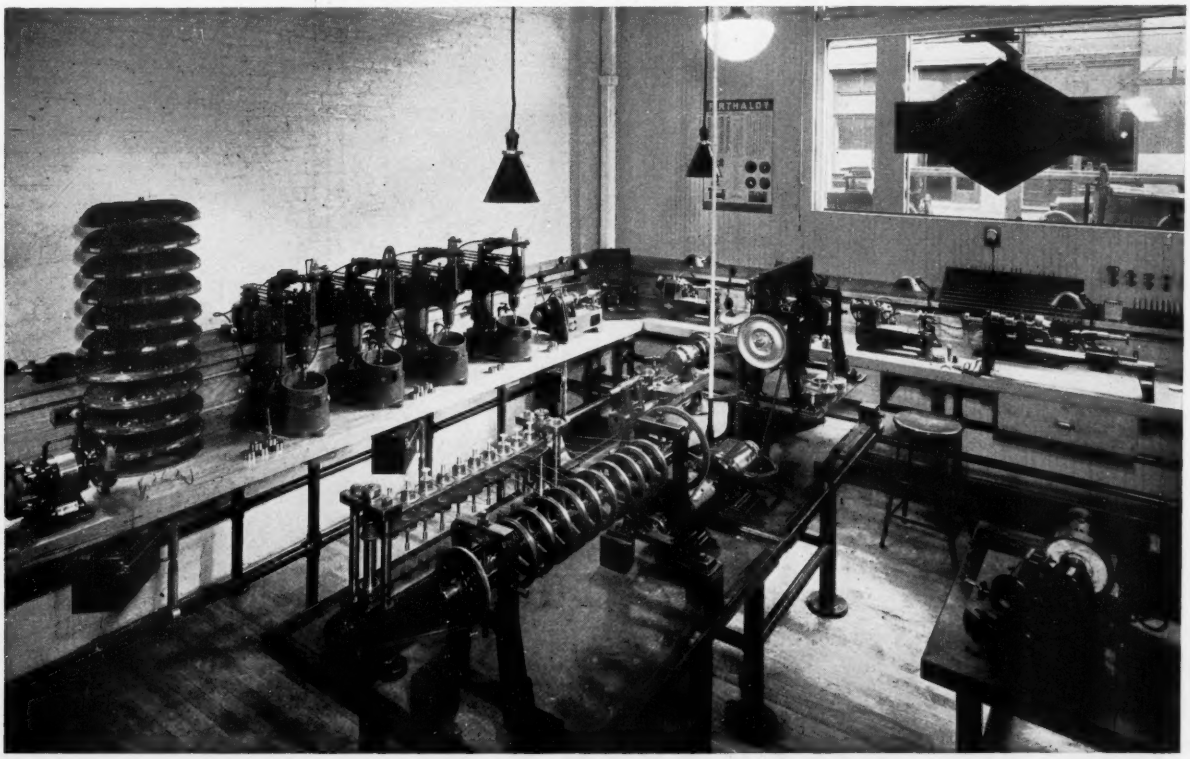
AS the day progressed the gathering assumed the character of an "old home" week—men who hadn't seen each other for a long time held real reunions and the general verdict of all was that the day was both interesting and profitable.



Partial view of new Chicago die plant for servicing Firthaloy dies in Midwestern Territory. ✦ ✦ ✦ ✦ ✦ ✦ ✦ ✦ ✦

FIRTH

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ONLY FIRTHALOY

Die Plants and B

Chicago, Ills. --- McKeesport,

✦ ✦ ✦

AT CHICAGO, ILLS.

we now have established a complete die plant equipped to manufacture and service Firthaloy Dies of all kinds in the mid-western area. ✦ ✦ ✦

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Firthaloy Service is Established f

Why Not Let Us Serve

FIRTH-STERLING STEEL COMPANY

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NEW YORK CH
HARTFORD CLEV
DETROIT PHILADE
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Result of the Constantly Increasing Use of
Sintered Carbide Dies ✦ ✦ ✦

stablished for Your Convenience !
t Us Serve Your Needs !

RAL OFFICE AND WORKS
McKEESPORT, PA.
H OFFICES AND WAREHOUSES
YORK CHICAGO
FORD CLEVELAND
OIT PHILADELPHIA
LOS ANGELES

FIRTH-STERLING
FIRTHELD
CASING

AT HARTFORD, CONN.

we will establish a duplicate of our Chicago plant on or about Sept. 1, 1935, to render service to our customers in the eastern area.

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FIRTH-STERLING STEEL COMPANY

Guage Board:—Note number and diversity of guage sizes required.

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FROM noon until the plant closed a buffet luncheon was served by a well known Chicago caterer. At seven o'clock all adjourned to the Palmer House for dinner which was held in the Red Lacquer Room. A capacity crowd was present and everybody had a good time.

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MR. **Gerald Firth,** President of the Firth-Sterling Steel Company, gave a short address of welcome—about a minute and a half long—as all speeches were barred and then every one settled down to enjoy about as good an after dinner show as one could hope to see anywhere at any time. The featured acts were all "big-time" vaudeville and the show was swell. Here's the bill:—

Maurie Sherman And His Broadcasting Orchestra
Elonire Williams, Beautiful Fan Dancer or —!!!
Six Byton Girls
Shay & Parker, Comedy Acrobats
Dorothy Norton, The Floradora Girl
Jordan Trio, Skaters
Florence Hen Low, Contortionist
Mary Daniels, Accordionist
Ruth Barton, Flirtation Singer

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DURING the day it was announced that an additional branch plant would be established at Hartford, Conn., about September 1st, 1935. This plant will be a duplicate of the Chicago plant and is designed to properly meet customers' requirements in the Eastern area.

The FIRTHALOY Division of The Firth-Sterling Steel Company

Extends An Invitation To All Wire Men

To Visit Their Various Branches At Any Time

Chicago, Ills. ✦ ✦ ✦ McKeesport, Pa. ✦ ✦ ✦ Hartford, Conn.

A Review of Recent Wire Patents

No. 2,000,095, INSULATED ELECTRIC CONDUCTOR, Patented May 7, 1935 by Earle C. Pitman, Princeton, N. J., assignor to E. I. du Pont de Nemours & Company, Wilmington, Del., a corporation of Delaware.

It is claimed that this conductor is particularly resistant to oil and grease, even if there is no outer lacquer coating. Surrounding the wire is a layer of rubber with a fabric layer surrounding the rubber layer, the former being impregnated with diethylene glycol phthalate.

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No. 2,000,355, DEEP-SEA ELECTRIC TELEPHONE CABLE, Patented May 7, 1935 by Eugen Sichtermann, Rodenkirchen, near Cologne, Germany.

Even if there is one sided pressure on the strand, it is claimed there will be no contraction of the channel nor disturbance of the air insulation, in employing this cable.

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No. 2,000,426, WIRE CLOTH TIGHTENER, Patented May 7, 1935 by Loren G. Symons, Hollywood, Calif., assignor to Symons Brothers Development Company, Hollywood, Calif., a corporation of Delaware.

More specifically, this tightener is employed with wire screens for maintaining the screens under tension.

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No. 2,000,428, ELECTRICAL CONDUCTOR, Patented May 7, 1935 by Albert C. Walker, East Orange, N. J., assignor to Bell Telephone Laboratories, Incorporated, New York, N. Y., a corporation of New York.

About the wire conductor is an insulated coating of partially acetylated cellulose having an acetyl value not greater than 35%, and about the last mentioned coating, a second coating of cellulose acetate bonded to the inner coating.

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No. 2,000,952, WIRE ROPE, Patented May 14, 1935 by Walter D. Hodson, Chicago, Ill.

Surrounding the wire core of this wire rope are fibrous rope strands impregnated with a grease composed of heavy mineral oil and alumninum oleate.

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No. 2,001,065, MANUFACTURE OF ELECTRIC CABLES, Patented May 14, 1935 by Maurus Klein, Berlin, Friedrichshagen, Germany.

More specifically, this method comprises the manufacture of signalling cables in pairs and includes twisting strands of insulated conductors, supporting loosely wound supplies of the strands and coils from below, then taking the strands not yet being under tension from the coils and drawing them by equal force through direct brakes coordinated individually to each of the strands. These brakes are worked by deforming the strands.

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No. 2,001,273, WIRE BENDING MACHINE, Patented May 14, 1935 by Frederick Wade Greer, Belmont, Mass., assignor to J. W. Greer Company, Cambridge, Mass., a corporation of Mass.

It is stated that this machine is particularly applicable for the manufacture of open mesh conveyor belts employed in the confectionery industry. A device is used in connection with the machine for making, in a length of wire, oppositely disposed offset sections connected by transversely bent portions of the wire, and other parts of the machine crimping the transverse portions.

Complete Descriptions and Drawings of Patents May Be Had for 25 cents. Address, Wire & Wire Products, 17 East 42nd St., New York.

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No. 2,001,319, CABLE, Patented May 14, 1935 by George J. Stanley, Pittsburgh, Pa., assignor to Aluminum Company of America, Pittsburgh, Pa., a corporation of Pennsylvania.

This cable comprises a steel core protected by a thin, corrosion-resistant sheet of metallic foil.

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No. 2,001,546, MACHINE FOR COVERING ELECTRICAL WIRES OR TAPES, Patented May 14, 1935 by Gaston Pourtier, Romainville, France.

The spools of covering material are unwound only when the required tension is attained.

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No. 2,001,677, WIRE BELT, Patented May 14, 1935 by Frealon Michael Gore, Oaklyn, N. J., assignor to Audubon Wire Cloth Corporation, Audubon, N. J., a corporation of N. J.

More specifically, the invention lies in the construction of a helical wire belt, the wires being coiled in one direction and having a selvage made up of short helically twisted interlocking wires coiled in another direction and interlaced with the end portions of the interlocking belt wires.

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No. 2,001,869, PROCESS OF MAKING LEAD - HEADED SCREW - THREADED NAILS, Patented May 21, 1935 by Albert J. Deniston, Jr., Chicago, Ill.

The process comprises taking a blank having a shank coated with corrosion resistant material and a pointed end and shaping screw-threads substantially throughout the length of the shank and terminating in the pointed end, the shaping thereof resulting in the surfaces of the threaded shank retaining a substantial protective covering of the corrosion resistant material and made bright and smooth to facilitate rotational driving of the threads of the fastener into holding position.

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No. 2,001,964, FURNITURE SPRING, Patented May 21, 1935 by Louis Kimbrig, Brooklyn, N. Y.

The outermost or end convolutions of these springs will not slip, loosen nor change in shape or size, according to the inventor.

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No. 2,002,148, METHOD OF MAKING GRID ELECTRODES, Patented May 21, 1935 by Leonard Klinkert, Eindhoven, Netherlands, assignor to Radio Corporation of America, a corporation of Delaware.

The method comprises winding a number of substantially parallel and suitably spaced grid wires about a number of vertical support rods, then interweaving the grid wires with a number of wires arranged in parallel relation to the support rods in order to maintain the grid wires in fixed spaced relation during manufacture.

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No. 2,002,261-63, RUBBER COATED STEEL OBJECT AND METHOD OF MAKING THE SAME, RUBBER COATED STEEL OBJECT, Patented May 21, 1935 by Elgin Carleton Domm, Niles, Mich., assignor to National-Standard Company, Niles, Mich., a corporation of Michigan.

These inventions cover the production of a brass coated iron base wire, separately coated with a thin layer of zinc and then a layer of copper to alloy throughout with the zinc at atmospheric temperature. A coating of rubber is then vulcanized on the brass coating. This wire, it is stated, is particularly adapted for use in the manufacture of tires.

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No. 2,002,399, FLAT SPRING AND METHOD OF MAKING THE SAME, Patented May 21, 1935 by Karl Kaden, Muhlbach Bez. Chemnitz, Germany.

The method comprises bending the wire laterally into a number of loops and longitudinally to give it a permanent set in a position of greater curvature than is assumed when it is in use.

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No. 2,002,461, RUBBER INSULATION FOR SUBMARINE CABLES, Patented May 21, 1935 by Robert R. Williams, Roselle, and Archie R. Kemp, East Orange, N. J., assignors to Western Electric Company, Inc., New York, N. Y., a corporation of N. Y.

The rubber insulation comprises rubber which has been highly freed of water soluble materials, and a filler, the particles of the filler being such as will pass a sieve of 100 meshes per inch but will not pass a sieve greatly finer than 200 meshes per inch.

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No. 2,003,123 WOVEN WIRE BELT FOR PAPER MAKING MACHINES, Patented May 28, 1935 by Harry G. Specht, Montclair, N. J., assignor to Eastwood-Nealley Corporation, Belleville, N. J., a corporation of N. J.

More specifically, the belt is such as is employed in paper making and comprises interwoven warp and weft wires with knuckles produced in both the warp and weft wires, the warp wires throughout their length being of non-circular cross-section elongated in one dimension, the elongated dimension being parallel to the plane of the woven wire fabric whereby the weft knuckles cross the elongated faces of the warp wires and have their outer projected surfaces substantially co-extensive transversely with the elongated faces to present a greater weft knuckle surface contiguous to the plane of the projected warp knuckles than would be the case if the weft knuckles were formed about circular cross-section warp wires.

Exports and Imports of Wire

Exports of Iron and Steel Wire Products in April, 1935 and April, 1934
(In gross tons)

	April 1935	March 1935	April 1934
Wire rods	1,330	1,354	1,795
Hoops, bands and strip steel	3,678	4,689	3,109
Plain black or galvanized iron or steel wire	2,678	3,470	2,630
Barbed wire and woven wire fencing	3,085	2,622	3,184
Woven wire screen cloth	41	97	67
Wire rope	423	525	339
Insulated iron or steel wire and cable—see analysis below			
Other wire and manufactures	497	590	438
Wire nails	938	1,270	1,461
Tacks	26	44	45
Other nails, including staples	194	226	379
Bolts, machine screws, nuts, rivets and washers	566	665	451
Total, these 11 classifications	13,456	15,552	13,898

Imports of Iron and Steel Wire Products Into the United States
(In gross tons)

Concrete reinforcement bars	117	92	26
Hollow bars and drill steel	158	50	70
Merchant steel bars	1,407	1,442	2,074
Wire rods	1,094	1,881	1,208
Barbed wire	1,491	1,349	1,423
Round iron and steel wire	1,813	3,364	855
Telephone and telegraph wire	339	330	224
Flat wire and strip steel	3	4	.....
Wire rope and strand	205	152	131
Other wire	189	204	154
Hoops and bands	57	70	61
Nails, tacks and staples	2,211	1,339	615
Bolts, nuts and rivets	19	28	48
Total, these 13 classifications	9,103	10,305	6,889

Exports

ALTHOUGH its participation declined 36.8 percent from the March total, the Far East with purchases aggregating 123,510 tons maintained its position as the leading outlet for American iron and steel products, and accounted for 60.2 percent of the total April shipments. The countries of North and Central America and the West Indies ranked next, taking 16.2 percent of the aggregate, while Europe followed with receipts to the extent of 15.5 percent of all shipments made. South America accounted for 6.4 percent of the April total, while Africa was the market of least importance with participation amounting to 1.7 percent of the aggregate.

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JAPAN continued in its role as the leading individual market on a tonnage basis taking 109,232 tons of all April shipments. This tonnage was made up chiefly of iron and steel scrap, 93,551 tons, ingots, blooms, etc., 8,067 tons, tin plate scrap, 2,882, waste-waste tin plate, 1,405 tons, wire rods 1,127, and tin plate and taggers' tin, 954 tons. Canada was the next market of importance with varied purchases aggregating 18,592 tons of which the chief items were black steel sheets, 4,425 tons, iron and steel scrap, 2,612 tons, steel bars, 1,865 tons, strip steel, hot rolled, 1,403 tons, plain shapes, 1,192 tons, and strip steel, cold rolled, 1,075 tons. The United Kingdom, 18,430 tons, came next and this total was practically all constituted of iron and steel scrap, 18,580 tons, while Italy's participation of 9,222 tons involved mainly iron and steel scrap, 8,447 tons, and tin plate and taggers' tin, 722 tons. Mexico was the fifth market of importance with a take of 7,773 tons. The principal products moving to Mexico during the month included iron and steel scrap, 2,659 tons, skelp, 978 tons, black steel sheets, 540 tons, tin plate and taggers' tin, 531 tons, and car wheels and axles 598 tons. China followed with purchases amounting to 6,543 tons made up principally of iron and steel scrap, 3,147 tons, heavy rails, 940 tons, tin plate scrap, 564 tons, waste-waste tin plate, 346 tons, and car wheels and axles, 312 tons.

Imports

AFTER coming to an abrupt halt in March, the import trade in iron and steel products during April resumed the upward trend evident over the past several months and totaled 28,866 gross tons, a sharp gain of 34.9 percent over receipts during the previous month. Gains were registered in 18 classifications when compared with the March trade, with losses in 14 products, while in 4 classifications no trade whatever occurred during the two months in question. The outstanding increases occurred in receipts of pig iron, 5,539 tons—in itself sufficient to turn the import trend upward—ferromanganese and spiegeleisen, 2,763 tons, nails, tacks, and staples, 872 tons, structural shapes, 509 tons, and rails and rail fastenings, 456 tons. On the other side of the ledger, the chief losses were recorded in barbed wire, 1,551 tons, scrap, 1093 tons, and wire rods, 787 tons.

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PIG iron jumped to the front as the leading item received on a tonnage basis during April, the total of 8,247 tons coming principally from the Netherlands, 3,281 tons, Canada, 2,330 tons, British India, 1,286 tons, and Norway, 1,100 tons. Ferromanganese and spiegeleisen constituted the next product of importance being received to the extent of 5,563 tons and originating chiefly in Canada, 2,900 tons, Norway, 1,214 tons, the Netherlands, 626 tons, and Germany, 321 tons. The 2,228 tons of structural shapes imported—practically all plain shapes—accounted for the third product in the month's trade and came almost entirely from Belgium, 1,760 tons, Germany 339 tons, and France, 123 tons. Nails, tacks, and staples, 2,211 tons, followed, the chief countries of supply including Germany, 1,569 tons, and Belgium, 616 tons, while barbed wire received to a total of 1,813 tons was the month's fifth product, and with the exception of a negligible amount was supplied by Germany, 1,519 tons, and Belgium, 289 tons. The sixth product was 'other hoops and

(*Please turn to page 295*)

Registry of Used Wire Machinery

We Offer—Subject to Prior Sale—The Following Used Wire Mill Machinery

No. 237
Electric Resistance Pointers, Capacity .148

No. 302
9 Die Richards Continuous Machine For Copper Rod

Waterbury stand spooler for fine wire.

No. 321
Electric Platform Truck
Capacity 6000 lbs.
Platform 41″ x 82″ x 22½″ High
24 Cells Edison A-6 Batteries

No. 348
Five-block rod bench with gear drive and motor, 26″ and 22″ blocks.

No. 400
Twenty head enameling machine complete, capacity down to .001.

No. 401
Eight head spooler, capacity 200 lb. spools, motor driven.

No. 402
Hayes electric furnaces, automatic control, with 32 head spooler, for fine wire.

No. 403
Waterbury straight roll fine wire machines, motor and belt drive.

No. 408
Barron and Crowther 3 hole continuous wire machines, ranges from No. 5 rod to 21 gauge.

No. 409
Wire pointers for bench or post mounting, ¼ to No. 12.

No. 418
Five 4-penny nail machines (German design)

No. 432
24 block intermediate frame with 16″ blocks, reducer, and pulley drive.

No. 441
Verticle Riehle tensile testing machines, 600, 2500, and 1,000

No. 445
Five-head S. & H. florist wire machine.

No. 447
Electric butt welders, 8 to 20 gauge steel.

No. 449
Electric butt welders, 4 to 20 gauge steel.

No. 450
Electric butt welders, 8 to 20 gauge copper.

No. 451
Electric butt welders, 5/16 to 1/8 inch copper.

No. 452
Spot welders, 18″ throat.

No. 456
Tinning equipment:
10 and 20 block fine wire units, 8″ block.
8 block unit for 16″ and 22″ blocks.

No. 459
Shuster straightening and cutting machine for ⅝ round.

WE HAVE BUYERS FOR THE FOLLOWING

No. 411
A 5-keg nail tumbler.

No. 416
Small riveting machines, Townsend No. 1 or equivalent.

No. 420
4 block rod bench, 22″ or 24″.

No. 427
2¼″ x 6″ c. r. mills with take-ups.

No. 430
Double stroke cold headers, Waterbury or Manville No. 0, up to 3/16 wire 1″ blank.

No. 435
Nail machine (roofing) ⅝″ head on 12 ga.

No. 436
Flattening mill for .10 x .014 stapling.

No. 439
Rivet machine for #7 ga. wire. Speed not important.

No. 442
Automatic keg-head printing machine, 9″ to 12″.

No. 443
Nail machines for
1″ x 15 SWG
1½″ x 11 SWG
2″ x 10 SWG

No. 444
Machine to make diamond pointed staples.

No. 446
Straightening and cutting machine for 12 to 16 gauge wire.

No. 448
7-wire planetary closing machine for 24″ reels.

No. 453
1 single head ripping machine for tungsten carbide dies.

No. 454
Vaughn Motobloc for ¾″ steel.

No. 456
Staple Machine, 8 and 8 gauge, 2 to 2¼″ length.

No. 457
Diamond die polishing machines
1 for .080
2 for .050
3 for .025

No. 458
Equipment for manufacturing Tungsten and Molybdenum wire, press and dies, slug treating, swaging, drawing and spooling machines.

Dunscomb Associates

BOX 320, C/O WIRE AND WIRE PRODUCTS — 17 EAST 42nd ST., NEW YORK, N. Y.

REGISTRY OF USED WIRE MILL MACHINERY

'Round the World With the Wire Industry

Proposed Syndicate by French Wire Fencing Manufacturers

MANUFACTURERS of wire fencing in **France** are contemplating the formation of a Syndicate looking towards the reorganization of the market and a better understanding between manufacturers and consumers. It is reported that approximately two-thirds of the total French production will be represented in this new group which will have its head office at 47, rue de la Victoire, Paris.

✦ ✦ ✦

IN connection with the agreement reached between the French and German representatives of the steel cartel at the meeting of March 30, 1935, concerning the new situation arising from the return of the Saar to Germany, it is announced in the French press that the two equal contingents of metallurgical products—one to be delivered to France by the German factories and the other to be delivered to Germany by the French factories—will amount to approximately 50,000 metric tons each.

✦ ✦ ✦

THE French Comptoir for galvanized cold rolled steel sheets, constituted August, 1933, represents all the French producers and in 1934 it sold approximately 78,000 metric tons of cold rolled sheets 1.½ mm. and less, as compared with a maximum monthly sales schedule of 12,000 metric tons in May, 1933, when the comptoir first began operating, it is further reported.

✦ ✦ ✦

German Firm Acquires Rights to Special Japanese Steels

ROBERT BOSCH A. G. in its annual report mentions that it has acquired the European rights to a new special kind of magnet steel developed by Prof. Tokuschichi, Mishima of Japan. It is understood that this steel which will be known as "Alnistahl" is an alloy of iron, nickel and aluminum, although cobalt can be added for special purposes.

✦ ✦ ✦

International Tube Cartel Dissolution May Adversely Affect Swedish Steel Mills

THE dissolving of the International Tube Cartel may adversely affect some **Swedish** iron and steel mills through bringing about increased competition in the domestic market from German and Belgian producers and also make it more difficult for the Swedish manufacturers to sell their tubes on the Continent. Exports of tubes from Sweden totaled about 29,300 metric tons in 1934, as compared with 30,300 metric tons in 1933, while imports of iron and steel tubes increased from approximately 9,400 metric tons in 1933 to 13,300 metric tons in 1934. It is expected that the dissolving of the Cartel will affect the market for low quality tubes to a

You can depend on
Rapid, Uniform, accurate welding
No. 30 to ¾ inch
WIRE and ROD
all metals

Micrometer Precision
MICRO-WELD
Trade Mark Reg. U.S. Pat. Off.

MICRO

Model "T" Butt
Automatic Welder

for
fast, accurate,
heavy duty service

Only
MICRO
has patented
speed - precision
adjustment dials

"There's a reason"
why many large concerns are operating 35 to 40 Micro Welders. Write us for details, and we'll tell you what MICRO can do for you.

Micro Products Co.
20 North Wacker Drive
Phone State 7468
CHICAGO, ILL.
Factory and General Office
PEORIA, ILL.

'Round the World With the Wire Industry

considerably greater extent than that of high quality tubes and that Swedish producers will find it more difficult than formerly to meet the competition offered in the domestic market by German and Belgian manufacturers.

✦ ✦ ✦

Broken Hill Proprietary, Limited, Production Continues at High Level

THE production of the Broken Hill Propietary, Ltd., of **Australia,** remained at a high level during March when pig iron output totaled 44,000 tons, representing a gain of 69 per cent over that of the corresponding month of 1934. This total, however, was 4.3 percent below the January output. The production of steel amounted to 41,000 tons, a gain of 36.8 percent when compared with the corresponding month of 1934, but a drop of 6.8 percent under the February total.

Gain Registered in Canadian Factory Sales of Steel Wire During 1934

A VALUE of $3,666,627 was reached in 1934 by factory sales of steel wire by **Canadian** producers as compared with $2,456,898 in 1933, and $2,345,000 in 1932, according to statistics published by the Dominion Bureau of Statistics, Mining, Metallurgical and Chemical Branch, Ottawa. The 1934 sales included 28,440 tons of plain wire, 14,938 tons of galvanized wire, 3,531 tons of other coated wire, and 12,206 tons of barbed wire.

✦ ✦ ✦

Opportunity for Sale of Tinned Steel Wire in Czechoslovakia

A PURCHASER at Vejprty, **Czechoslovakia,** has acquainted the American Consul at Prague, with a desire to purchase tinned steel wire. Further particulars may be obtained by interested subscribers from the Bureau direct or through its District or Cooperative Offices by referring to Trade Opportunity No. 8804.

✦ ✦ ✦

Austrian Tube Makers Form Cartel

SIX **Austrian** tube makers have concluded an agreement to regulate their mutual production, sales and prices of welded and seamless tubes. No price advance is reported contemplated by this new Rohrenverband.

✦ ✦ ✦

Continental Steel Wire Cartel Prices

THE continental steel wire rod cartel has fixed prices for first, second and third quality. The price for the first quality is £4.10 to £4.15 gold per ton f. o. b.; for second quality a new price of £3.17.6; and for third quality £2.36 was recently fixed. Usually 4 to

(*Please turn to page 286*)

Announcing

The Mark of CARBOLOY

The Appointment of . . .

HARTLEY WIRE DIE COMPANY

Waterbury, Connecticut

as an Authorized Distributor of

CARBOLOY* DIES

It is with pleasure that we announce the appointment of the Hartley Wire Die Company of Waterbury, Conn., as an authorized distributor of Carboloy Dies. The facilities of this old, established concern with more than three-quarters of a century of experience in the wire die field will supplement the present sales and service facilities of our Newark Office. These combined facilities enable us to offer you the most prompt, efficient service in the cemented carbide die field.

CARBOLOY COMPANY, INC.

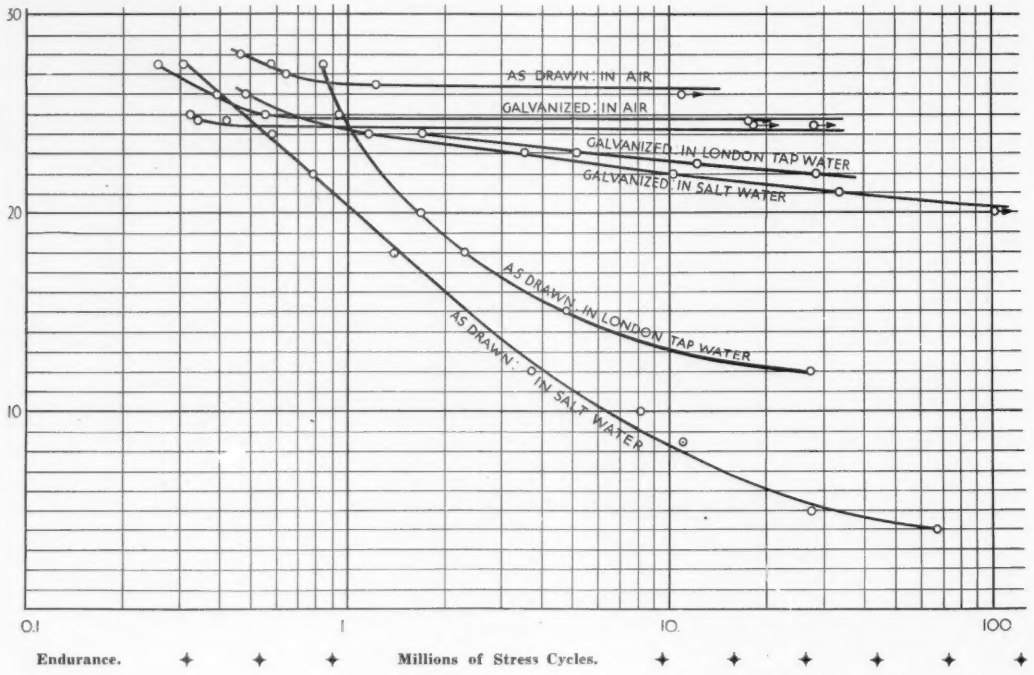
CHICAGO • CLEVELAND • DETROIT • NEWARK • PHILADELPHIA • PITTSBURGH

*Carboloy Cemented Carbide

Fatigue Testing Machine For Wire

(*Continued from page 274*)

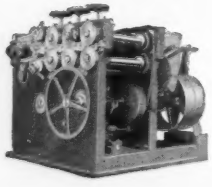
mid-length in a wire of diameter d is $\frac{d}{2R} = \frac{\pi}{2}\theta\frac{d}{L}$ and the bending stress is given by $f = E\,e = \frac{\pi}{2}\theta\frac{d}{L}E$.



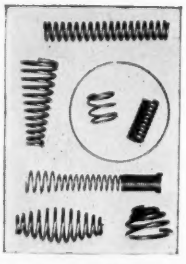
Sleeper & Hartley
TRADE MARK

DESIGNERS OF "THE MACHINES THAT PUT THE 'RINGS' IN SPRINGS"

UNIVERSAL SPRING COILERS IN FOURTEEN SIZES!



UNIVERSAL SPRING COILING MACHINES are built in fourteen sizes, handling cold, oil-tempered wire from .004" to ⅝" diameter. Produce an extraordinary variety of spring forms (a few of which are seen at the right) at high speeds. The machines are offered in two types, both of which automatically close and square the end coils as desired. Bulletin Nos. 101 and 101-A give full details.



In addition to many other standard spring and wire coiling machines, spring-hooking, and spring-set-ting machines, we offer:—
Book Spiral Coiling Machines. Bearing Spiral Machines.
Flat Ring Coiling and Edgewise Coiling Machines.
Torsion Spring Machines. Lockwasher Machinery.
Flexible Casing and Flexible Metallic Tubing Machines.
Rolling and Flattening Mills and Take-Ups.
Wire Nail Machines. Wire Reels.
Wire Drawing and Wire Spooling Machinery. Wire Mill Equipment.

Thus both stress and strain are proportioned to θ and to the ratio $\frac{d}{L}$. In these formulæ, θ is expressed in radians. When θ is greater than about 20 deg. the curve of flexure becomes perceptibly different from a sine curve, being in fact, an elastica, and it is for this reason that the correction, previously mentioned, must be made. There is, of course, a compressive stress in the specimen, but as this is very small in comparison with the bending stress, its effect upon fatigue failure is negligible.

✦ ✦ ✦

THE results obtained with the machine are well illustrated by the diagram, Fig. 8, which was obtained from an investigation carried out to check results obtained in 1917 by very different methods, actually by towing ropes at sea. The same wire was used throughout the investigation, which showed that while galvanising slightly reduces the fatigue strength of wire tested in air, it greatly increases it when tested in tap water or salt water. In general, the diagram is self-explanatory, but attention may be drawn to the interesting fact that the fatigue limit of galvanised wire is slightly higher when tested in salt water than it is when tested in tap water.

✦ ✦ ✦

IN conclusion, it may be pointed out that the machine is of interest not only to manufacturers and users of wire. Tests may be made on any material that can be forged, rolled or cast into a rod and subsequently turned, ground, extruded or drawn into a wire. The effect of any subsequent process, such as heat treatment, on the fatigue limit can then be rapidly and conveniently investigated.

✦ ✦ ✦

Saar Wire Producers Join German Wire Cartel

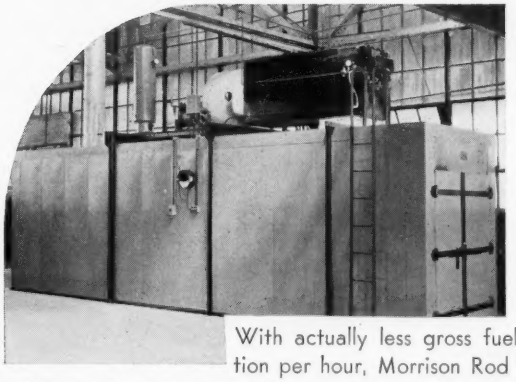
THE whole of the Saar industry, also the wire netting manufacturers, are now members of the German wire cartel. Exports of wire netting from the Saar show a fair increase.

A. D. Wilson Elected President of Bristol Brass Corporation

ALBERT D. WILSON has been chosen by directors of the Bristol Brass Corporation to succeed the late Alexander Harper as president of the corporation. Mr. Wilson will continue in the position of treasurer, it has been formally announced. Frederick M. Seibert has been chosen to fill the vice-presidency vacancy due to the promotion of Mr. Wilson.

MR. Wilson started in the company as a factory employee 33 years ago. He is a native of Bristol. He was made a bookkeeper of the concern in 1904 and cashier in 1907. He was elected assistant treasurer in 1918 and three years later became vice-president at the time Mr. Harper succeeded the late Albert F. Rockwell, as president. In March, 1929, he was made vice-president and treasurer.

NEW ROD BAKER
Yields Savings up to 50%



U. S. PATENT NO. 1,999,513

A four-truck rod baker, typical of the equipment which is individually engineered for every installation by Morrison experts.

With actually less gross fuel consumption per hour, Morrison Rod Bakers are successfully doubling the production commonly experienced with equipment of similar size but not possessing the patented Morrison features. The principal of recirculation of heated air under exact thermal and atmospheric control produces rod of perfect physical quality for subsequent drawing. All adjustments are made with a single burner. These vital advantages are, today, yielding new profits to alert organizations throughout the country. May we indicate where they will fit into your own requirements?

ADDITIONAL MORRISON ENGINEERED EQUIPMENT

Convection heating equipment for paint, foundry, ceramic, and lithographing ovens. Tank and process heating up to 1400° F.

THE MORRISON ENGINEERING CO., Inc.
5005 EUCLID AVENUE CLEVELAND, OHIO

'Round the World With the Wire Industry

(*Continued from page 283*)

6% of the total production turns out as second and third grades (rods of short lengths, unequal diameter, etc.). It has been noted on the export market that quantities were sold, which were two to three times higher than the amounts of second and third quality. The export sale of second and third grades were free to the members of the cartel and a few have taken advantage thereby selling the first grade at cut prices masking the sale as that of second grade. The low prices for the last products will make such business difficult.

✦ ✦ ✦

German Cable Exports in 1934

GERMAN cable exports declined heavily in 1934 as indicated by the following table.

1933	
First six months	10,966 tons
Second six months	10,445 tons
1934	
First six months	7,844 tons
Second six months	8,144 tons

IN the first quarter of 1935 exports were 5,008 tons compared with 4,322 tons same period of 1934. The average selling values show a further decrease due to price concessions on the export market.

✦ ✦ ✦

Italian Barbed Wire Absorbed by War Requirements

ITALIAN shipment of barbed wire to the Italian Colonies the first quarter of this year were 900 tons, 12 times more than last year. Italian wire competition has virtually disappeared from the Near Eastern markets, as the industry is working nearly full time for war requirements against Abyssinia.

✦ ✦ ✦

Sheffield Firm Adds Large Rolling Mill

ARTHUR Lee & Sons, Limited, Bessemer Road, Sheffield, England, has added a large continuous rolling mill for the hot rolling of steel strip in coil. This mill is capable of rolling up to 100 tons of strip per shift, according to the size of the strip, in sizes from 1 to 16 inches in width, and the average output is estimated at 1,000 tons per week.

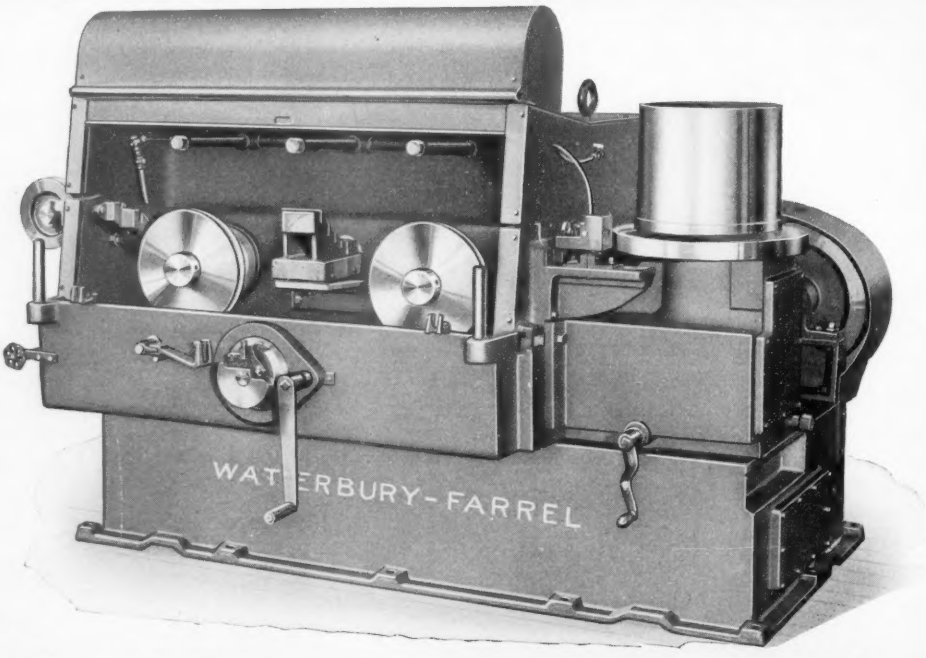
✦ ✦ ✦

Gain in Canadian Wire Nail Sales During 1934

CANADIAN factory sales of wire nails of all kinds during 1934 are given at 106,471,000 pounds worth $3,393,639 (Canadian), a substantial increase over the 74,336,418 pounds valued at $2,498,894 during the previous year, according to information supplied by the Dominion Bureau of Statistics, Mining, Metallurgical and Chemical Branch, Ottawa. Production of wire nails in Canada during the year under review amounted to 106,240,700 pounds and as of December 31, factory inventories amounted to 14,553,700 pounds. Production of cut nails amounted to 1,234,100 pounds and the inventory at the end of the year totaled 409,500 pounds.

No. 3-7 DIE FOR BRASS

CLEANER WIRE AT LOWER COSTS AND BETTER QUALITY AT HIGHER SPEEDS



Waterbury Farrel Foundry and Machine Company

Waterbury, Connecticut

OFFICES

CLEVELAND CHICAGO PHILADELPHIA

New Zealand Imports Increased Amount of Fencing Wire

ALTHOUGH the importation of fencing wire into New Zealand from all sources was at about the same level as the preceding months during February, the amount imported from the United States showed a decided increase, being valued at £1,970 New Zealand, in January and £3,490 New Zealand in February. This is the only item in the list of iron and steel manufactures in which American exporters participate.

✦ ✦ ✦

Upturn in German Wire Industry Ended

THE upward trend in the production and sales of the German wire and wire products manufacturing industry, which persisted throughout 1933 and 1934, would appear to have reached its climax, according to a report from Vice Consul James H. Wright, Cologne. Deliveries during the first quarter of 1935 were not higher than those during the same period of last year and it is complained that better business would have been experienced had it not been for unfavorable weather conditions. The immediate future outlook, however, is said to be optimistically viewed in trade circles, and manufacturers and dealers are building up their warehouse stocks in the expectation of brisk spring and summer business. By far the more satisfactory trade is being carried on in special wires, demand for barbed wire, wire rope, fencing, etc., holding a less prominent position. German exports of wire and wire products during 1934 amounted to 225,240 metric tons, representing a decrease of 1.8 percent when compared with shipments during the previous year.

✦ ✦ ✦

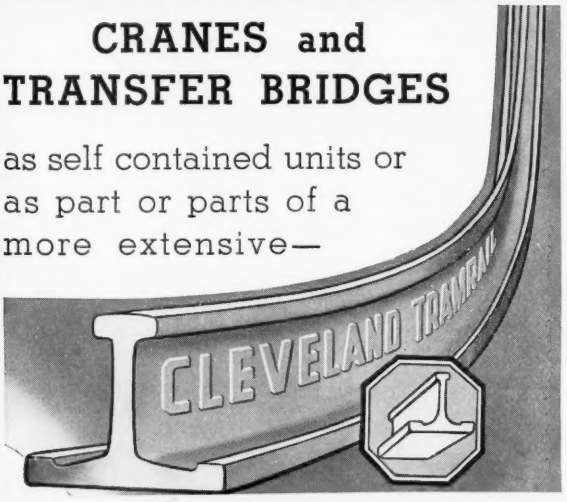
Efforts to Be Directed Towards the Creation of a Turkish Iron and Steel Industry

DEVELOPMENTS in private domestic production of iron and steel products in Turkey have been rather limited during the past two years and have been confined practically entirely to the smaller items and the government has directed particular efforts towards the creation of a domestic iron and steel industry on a relatively large scale. The large military plant located at Kirik Kale, between Ankara and Cesarea, about 70 miles west of Ankara, has increased its activity during the past two years and has been provided with additional equipment. The Five Year Plan of the Turkish Government provides for the creation of an official iron and steel industry and one of the first projects contemplated by the Government in the above connection is the creation of an iron and steel furnace at Eregli on the Black Sea, details of which are not available. An agreement which has been entered into between the Turkish Sumar Bank and a German Consortium headed by the Krupp interests provides for a loan of 8,000,000 Turkish pounds to be granted to the Sumar Bank for the purchase of equipment from Germany for the establishment of a Turkish iron and steel works. The German Con-

(*Please turn to page 297*)

CRANES and TRANSFER BRIDGES

as self contained units or as part or parts of a more extensive—

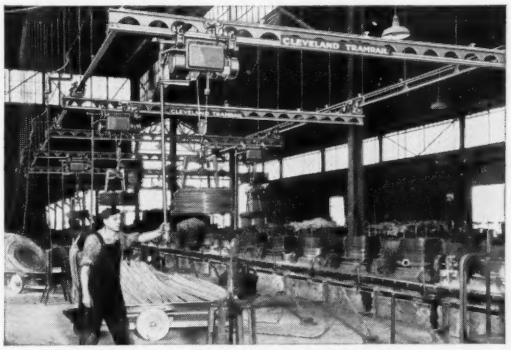


OVERHEAD MATERIALS TRANSPORTATION SYSTEM

give complete coverage or unit coverage for just the portion of your plant requiring this service under either full or short time production schedule.

Starting Effort 15 pounds . . . per Ton of
Running Effort 10 pounds . . Total Weight

Smooth running for the most delicate or dangerous load.



• Because of their low head room requirements, their easy, snappy operation: Cleveland Tramrail Cranes are used extensively for block stripping. Some plants having more than 100 installed.

Consult your 'phone directory under "Cleveland Tramrail"

CLEVELAND TRAMRAIL

THE CLEVELAND CRANE & ENGINEERING CO.
WICKLIFFE OHIO

Needle Manufacturing in Germany

By Fritz Tillmann, Iserlohn, Germany

WHILE the methods of manufacturing needles was known in England and at Nűrnberg and had also been known for several centuries at Aächen, their manufacture was not introduced at Iserlohn (Westphalia) until the beginning of the 18th century.

THE manufacture of needles in this section was the result of continued development of the wire and wire goods manufacturing business in the immediate neighborhood, this manufacture dating back to the production of wire rings for armour made there during the middle ages.

Cold Heading with AJAX-HOGUE WIRE DRAWERS
ACTUAL OPERATING AND COST FIGURES ARE GIVEN IN THIS PAMPHLET
AJAX
THE AJAX MANUFACTURING CO.
CLEVELAND, OHIO
Office: 621 Marquette Building
HOW TO SAVE THOUSANDS OF DOLLARS IN "COLD HEADING"
• Actual production figures . . . actual savings on various sizes of bolts . . . actual figures on savings in material costs . . . are contained in our pamphlet "Cold-Heading with Ajax-Hogue Wire Drawers." It's yours for the asking . . . send for it.
It's yours for the asking ! !
SEND FOR IT TODAY!
MANUFACTURED BY
AJAX
THE AJAX MANUFACTURING CO., CLEVELAND, OHIO
Chicago Office: 621 Marquette Building

UNTIL the first quarter of the 19th century needles were manufactured entirely by hand and were made for the greater part in the homes of the workmen. In this period however sewing needles were produced by machinery in England and within a period of ten years after the introduction of such machines, the English needle manufacturer dominated the world market.

✦ ✦ ✦

A FIGHT then began by the Germans to maintain their needle market but it took them about ten years to fully understand the English methods of production and manufacture machines enabling them to reattain their position in the needle market.

✦ ✦ ✦

BY 1875 the firm of Stephan Witte & Co., Iserlohn, Germany was considered to have the largest needle factory on the continent but even then it was necessary to devise many improvements in the mechanisms of the machines as up to that time the most difficult part of the manufacture still had to be done by hand.

✦ ✦ ✦

DURING the years following 1875 they succeeded in improving the technique of manufacture after a long and hard struggle to a point where they finally developed a process for the manufacture of the sewing machine needle to a practically automatic basis.

✦ ✦ ✦

AT the present time in manufacturing these needles very fine steel wire is used which is delivered by fine wire spoolers.

✦ ✦ ✦

The Process

THIS wire is first straightened and then run into a cutting machine where it is cut into lengths just long enough to make two needles of the size required. It then goes to another machine where the blunt ends of the wires are gripped together by a grindstone and sharpened and pointed. At the same time heavy stamping machines punch in the center of the "shaft" (pieces of wire) two

eyes, one lying behind the other. After this is done the eyes are finally bored and the unfinished double needles are gripped at both ends by the teeth of the complicated automatic machine, broken in the center just between the two eyes, immediately pressed on a grind-stone and the rough ends which had formed outside the eyes during the process of stamping out and boring the double needles, smoothed off. This ends the completion of the rough finish and the needles are next subject to the polishing process.

✦ ✦ ✦

THE needles are now hardened by being put into an oven and made red hot. They are then immediately immersed into a wooden tank filled with rape-seed oil and allowed to cool.

✦ ✦ ✦

IN order to eliminate brittleness and to obtain the requisite springiness the needles are next placed into a gasflame. They are then made into special round packs tied together and mixed with fine gravel and oil.

THESE round packs are rolled backwards and forwards for weeks at a time on long moving tables and in machines until the old coarse polish has been replaced by a much finer one. This is continued at regular intervals until the needles have obtained the requisite smoothness. In order to remove the gray residue of the used polishing materials the needles are again cleaned with paraffin and wiped with a fine wash-leather. This gives a very high polish. Unusual requirements such as nickel finish or gold-eyes are attended to at this point.

✦ ✦ ✦

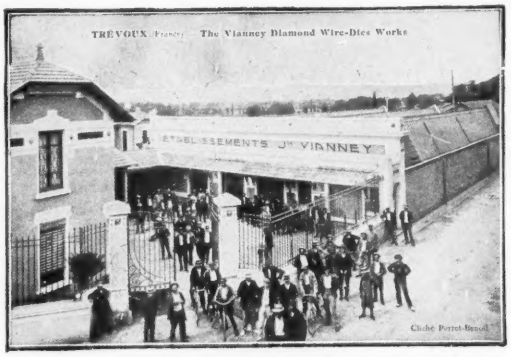
THE packers then inspect the needles carefully, sorting out and retaining all damaged ones, and the finished needles are then automatically packed in a paper envelope or pierced into paper or cloth strips. The packages of needles which are intended for the foreign market are packed in zinc tins and soldered as a protection against dampness and salt air.

Donald A. Crosset, General Manager Alloy Metal Wire Co.

THE Alloy Metal Wire Co., Inc., Moore, Pa., announces the recent appointment of Donald A. Crosset as Secretary-Treasurer and General Manager, taking complete charge of plant production and sales activities. Mr. Crosset joined the Alloy Metal Wire organization at its inception, advancing to the office of Secretary and Engineering Director prior to this new appointment.

✦ ✦ ✦

AS a metallurgical engineer, Mr. Crosset brings to his new position a thorough knowledge of wire, strip and rod manufacturing in all its phases. In addition, he has also been continuously active in lending his knowledge to Alloy's manufacturing customers and is largely instrumental in straightening out their production problems thus giving substance to Alloy's policy of "Service Beyond the Sale."



The largest Diamond Die plant in the World is located at Trevoux, France.

✦ ✦ ✦

The plant is one of three now owned and operated by **Etablissements Joseph Vianney** in France beside the New York plant. Up to 300 men are employed.

✦ ✦ ✦

1869--Joseph Vianney conceives and makes the **first** wire drawing diamond die.
1882--Joseph Vianney establishes the first diamond die plant.
1889--Awarded Gold Medal, the only prize for Diamond Dies, Paris Exhibition.
1893--Awarded Gold Medal, the only prize for Diamond Dies, Chicago Exhibition.
1924--Now operates 3 plants and 1 repair shop. Capacity 3000 dies monthly.
1930--Vianney Die sales in U. S. and Canada totals 142,428 dies since 1916.
1935--Starts making light weight stones in connection with standard weights, all with usual guarantees of weight, workmanship, shape and exactness.

✦ ✦ ✦

LARGEST stocks available in U. S. at moderate prices and guaranteed weights in all sizes from the very finest .00039 to .080 in 2 types of stone weight.

✦ ✦ ✦

Represented in New York, since 1909, by

VIANNEY WIRE DIE WORKS

250 East 43rd Street 'Phone MUrray Hill 4-3250

For Superior Case Hardening . . .

*CONTINENTAL KONIK METAL

A new metal, KONIK, is now available to manufacturers of machine parts that are subjected to wear, abrasion and corrosion. KONIK Metal (patented) is a high grade, basic open hearth special analysis steel containing *copper, nickel* and *chromium* . . . It is tough, ductile, and readily workable. It resists atmospheric corrosion far better than ordinary steel, although it is not a stainless steel.

Among its important characteristics, KONIK Metal possesses unusual properties for case-hardening, it takes a deeper case than the usual straight carbon steel and is readily amenable to heat treatment. KONIK is supplied in various finishes and sizes. Our metallurgists have demonstrated many remarkable advantages and savings for manufacturers, and they are at your service.

CONTINENTAL STEEL CORPORATION

KOKOMO, INDIANA

Manufacturers of Billets, Rods, Wire, Barbed Wire, Nails; Lawn, Chain-Link, Diamond Mesh, Farm and Poultry Fence; Gates; Black, Galvanized, Galvannealed and Special Coated Sheets; Galvanized Roofing; also "Seal of Quality" Roofing and Kindred Products.

Cuppy Wire

(*Continued from page 266*)

ing into disuse, is one which exerts a reviving effect on the torsional properties, the reversion easing the compressive stresses set up by previous work.

✦ ✦ ✦

Tensile Strength — How Affected

TENSILE strength of a wire is described as the strain essential to cause a fracture by a single application of the pull. Lower stresses, frequently applied, also cause fracture, the application and release effecting a change in the state of the metal and inducing a brittle condition known as fatigue.

✦ ✦ ✦

HIGH tensile rope wire is susceptible to this form of defect in almost every process of manufacture after leaving the cleaning department, particularly so during the drawing operation, and in the rope at work the condition is induced if overstrained, the elastic limit exceeded, or a repetition of minor stresses allowed to continue.

✦ ✦ ✦

THE most frequent cause during the drawing operation is too rapid reduction, i. e. reducing without provision of a rest interval. The best practice when drawing 0.70 to 0.85 carbon content, tubed material to a specified tensile stress is to reduce in single draft form, first roughing or performing first draft to about 6 coils before commencing second draft.

✦ ✦ ✦

BY the adoption of this method each coil is given a rest period between drafts of 1½ to 2 hours without curtailment of output, and though various schemes have been tried to curtail the resting time, no other successful method of coping with this defect has so far been devised.

✦ ✦ ✦

Material in Fatigued Condition

MATERIAL in fatigued condition can be restored to normal by heat treatment, but apart from decrease or loss of tensile

strength the material so treated rarely gives the same service as when free from this defect.

✦ ✦ ✦

THE majority of fractures of wires in ropes at work are due to fatigue induced by the various strains set up during running operations. Maximum stress applied may be such that the damage in non-apparent, yet repeated applications may cause fatigue ultimately leading to fracture.

✦ ✦ ✦

WHILE to describe in detail each known stress and its effect on the life of the rope would take too much space, it may be said that the principal cause of fatigue in ropes at work is the vibrations set up by suddenly applied shocks or stresses. Contrary to what was at first assumed the strength of these vibrations is not evenly distributed over the length of the rope, but tend to increase as the distance between the load and the drum is decreased. It is chiefly due to this fact that rope makers advise as great a length as possible between the drum and the pulley, claiming that the longer the length the greater the reduction of angle of lateral deviation.

✦ ✦ ✦

Locked Coil Ropes

LOCKED coil winding ropes, notwithstanding their lesser flexibility, are affected least by fatigue; the peculiar shapes of which the outer layers are constructed and the ability to pack greater bulk of metal within given area, obviating this trouble to a great extent. The locking of the circumference, preventing the movement of inner wires and reducing wear to minimum, also acts as a preventive of this defect.

✦ ✦ ✦

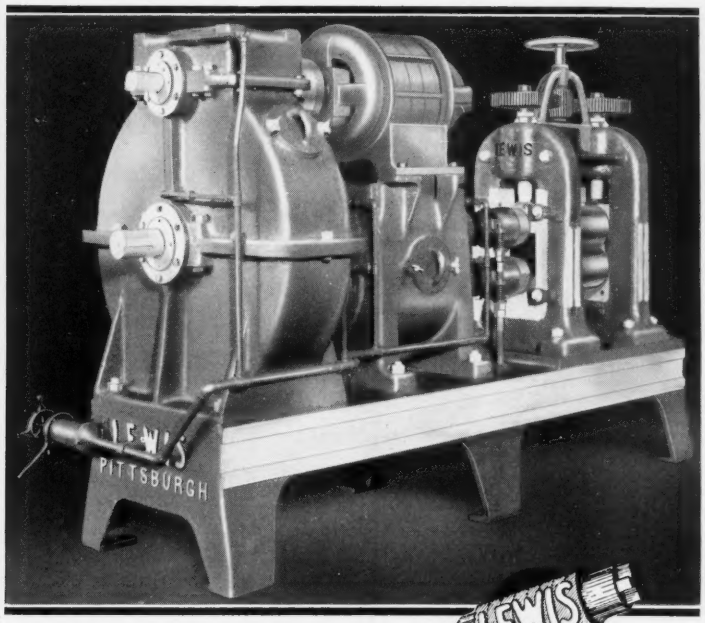
IN the formation or drawing of locking wires fatigue is rarely set up, probably due to the more frequent heat treatment than is necessary in cylindrical reduction, and also less aggregate depth of reduction between annealing and finishing stage.

✦ ✦ ✦

THE peculiar design of the locked coil wire also spreads the strains set up by drawing, the

(*Please turn to page 294*)

LEWIS WIRE FLATTENING AND NARROW STRIP MILL



Unit Construction.

Lewis Cut Herringbone Gear Reduction Unit directly connected through a flexible coupling.

Forged Steel Pinions.

Bearings are lubricated by compression grease cups.

All gears run in oil.

Neck Bearings are die cast genuine babbitt or roller bearings.

Housings have T slots for attaching coilers and guide bars.

This Mill is built in a complete unit and can be moved at any time to any desired location in the plant. The rolls may be of any quality specified by customer, including hardened steel rolls, or water cooled rolls.

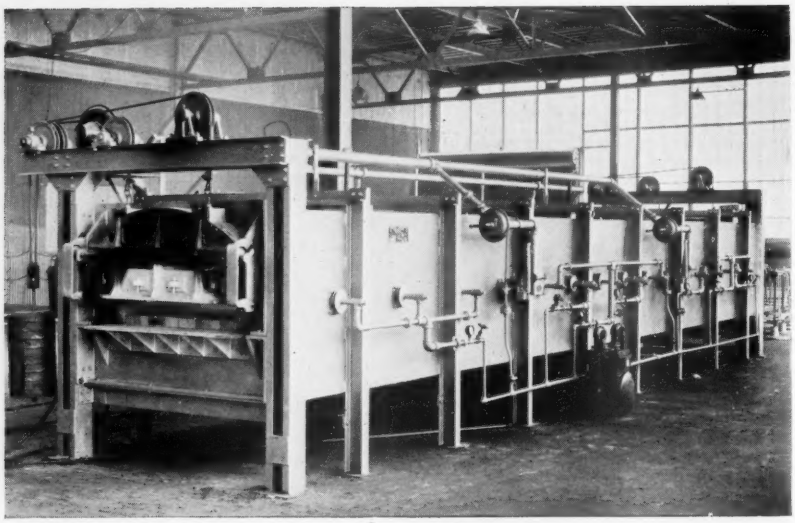
• • •

LEWIS MAKES A COMPLETE LINE OF ROLLING MILL MACHINERY INCLUDING:

Mill drives up to and including 6,000 HP. Shape Straightener Machines up to and including 24 inch I beam. Motor operated Screw-Down for Mill. High Speed Gear Sets for Continuous Rod Mills. Continuous Bar and Billet Mills. Cold Mills for Sheet and Strip. Rail Breakers. Rail Re-Rolling Mills. Universal Mill Spindles. Chilled Iron and Iron Alloy Rolls for Iron, Steel, Brass, Copper, Aluminum, Zinc and Nickel. For hot Sheets, tin plate and strip—for cold sheets, tin plate and strip. For merchant bars and rods, Shears—Vertical Alligator—Cropping—Plate and Squaring. Special Machinery—Testing Machines and Iron and Steel Castings.

PITTSBURGH, PA.

LEWIS FOUNDRY & MACHINE CO.



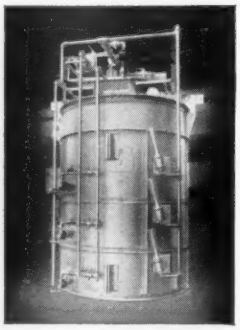
FURNACES FOR HEAT TREATING WIRE

SC Furnaces for wire patenting, hardening, or annealing, permit increased production,—cleaner surface,—better physical properties,—dependable uniformity.

The patenting furnace illustrated above gives all these results and in addition fuel economy is obtained.

You will want to obtain all these results, no matter what your heat treating operation or problem may be. Call on Surface Combustion Engineers—they will be glad to consult with you.

The bell type, **controlled atmosphere** *annealing furnace illustrated at the right, anneals wire coils or coils of strip—clean, with uniformly high quality and with economy.*



Write for information on this or other types of **SC** furnaces.

Surface Combustion Corporation

SC TOLEDO, OHIO Sales and Engineering Service in Principal Cities

Also makers of.. ATMOSPHERE FURNACES... HARDENING, DRAWING, NORMALIZING ANNEALING FURNACES... FOR CONTINUOUS OR BATCH OPERATION

Diamond Dies

(*Continued from page 271*)

Summary

THE above processes, as outlined, have not attempted to demonstrate the skill required in the success of the operations because it is generally conceded that special hand skill is required at every stage of this process. It is sufficient to say that without the aid of highly skilled operators and of careful inspection and supervision, that no diamond die will be acceptable to the trade when it is completed.

✦ ✦ ✦

AS we explained in the first part of this paper, (Published in May) it is the intention of the diamond die division of the **Association of Wire, Rod and Tube Die Manufacturers, Inc.,** to acquaint the users of diamond dies with as much information concerning the diamond die as is available. It can be readily appreciated that to attempt to compress in a few thousand words the history and complete manufacturing data of an entire industry, is beyond all question of doubt, impossible. This article is, we hope, just the beginning of our efforts to acquaint you with the industry. It is further hoped that by co-operative efforts between die manufacturer and die user that the standard of our industry will be raised and, also, the quality of our product. The more light that is shed on the subject of our jobs, the better our dies should be.

✦ ✦ ✦

Francis M. Rich, Superintendent of Republic Blast Furnaces at Buffalo

FRANCIS M. RICH, superintendent of blast furnaces at Youngstown for the Republic Steel Corporation, has been transferred to Buffalo, in the same capacity.

✦ ✦ ✦

MAKE YOUR PLANS NOW TO COME TO THE WIRE ASSOCIATION MEETING

Testing Cable Sheath For Fatigue

(*Continued from page 269*)

from the field trials. This correlation, however, will only be possible following compilation of complete field data such as is now being obtained on cables of various types and thicknesses of sheath at the Outside Plant Laboratories at Chester. A typical fatigue curve obtained from the latest type of machine is shown in Figure 5. This curve shows that as the fibre stress is decreased the number of reversals required for failure increases rapidly. At a certain stress (the endurance limit), which is represented in the figure by the approximately horizontal portion of the curve, the number of reversals of stress required for failure becomes indefinitely great. In other words, for any lower stress the material can endure an unlimited number of reversals without failure.

✦ ✦ ✦

A SPECIAL room at the Bell Laboratories is devoted to these fatigue studies of metals. Although a very considerable amount of data has been gathered by the use of these machines in testing for the fatigue characteristics of cable sheathing material, the field of fatigue testing is still felt to be in its infancy.

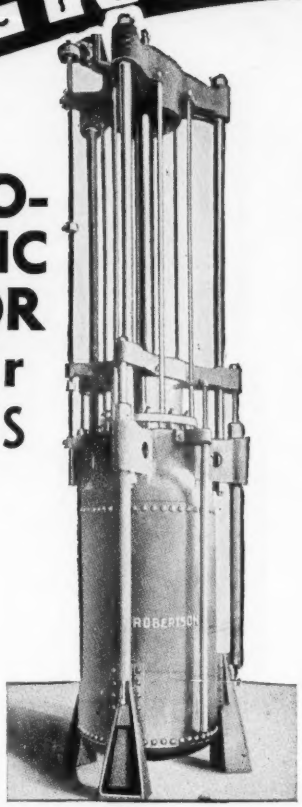
✦ ✦ ✦

New 80 Page Handbook on Resistance Wire

WILBUR B. Driver Company (formerly Gilby Wire Co.) of Newark, New Jersey, manufacturers of resistance wire for the electrical, radio, chemical, mechanical and automotive industries have just published a new 60-page resistance handbook. This manual contains a great many tables and charts pertaining to the design and construction of electrical heating units, and will be of keen interest to the engineering profession. Copies may be had by simply writing to the main office and works located at Riverside Avenue, Newark, N. J.

MAKE YOUR PLANS NOW TO COME TO THE WIRE ASSOCIATION MEETING

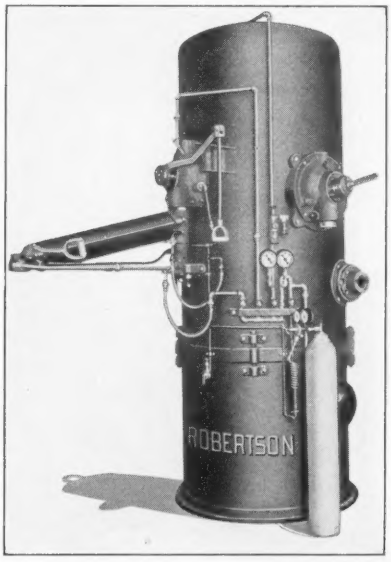
THIS MODERN HYDRO-PNEUMATIC ACCUMULATOR —helps cut your PRODUCTION COSTS



The Robertson Accumulator, because of its many outstanding advantages, makes the old slow, space taking accumulators entirely out of date.

These new units take up only the smallest amount of floor space, and they use their air tanks as a base (no special heavy foundations are required). Other features are: Only 175 lbs. pressure required for operation—An automatic auxiliary air compressor that maintains a consistent pressure in cylinder and air tank.

All told, the Robertson Accumulator is positive and quick acting and absolutely safe, assuring long, efficient and trouble-free service.



The Latest ROBERTSON Lead Melting Pot

--keeps Oxide Formation to a minimum

This pot reduces the formation of oxides and dross to an absolute minimum by the use of CO_2 gas over the lead in the melting pot and in the closed pouring spout, as well as for flushing the lead cylinder.

It is a worthy companion to the complete line of Robertson equipment which includes Extrusion Presses, Lead Encasing Presses, Hydraulic Pumps, etc., etc.

John ROBERTSON CO. INC. Pioneers~Since 1858

131 Water Street Brooklyn, N. Y.

AMERICAN LIME & STONE COMPANY
Bell-Mine Products
WARNER COMPANY—MANAGEMENT

$C_a CO_3$=98+

is the average analysis of Bell-Mine Limestone. This stone is remarkably free from impurities. Therefore the lime burned from it in Bell-Mine Rotary Kilns is remarkably pure.

Bell-Mine Pulverized Lime when used in wire drawing processes yields a large volume of fine putty which serves as a superior bond between rod and lubricant and which does not scratch the wire.

Choose and Use
Bell-Mine Products

AMERICAN LIME AND STONE CO.

PLANT and EXECUTIVE OFFICE: BELLEFONTE, PA.

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KEYSTONE

More and more wire converters are turning to Keystone for their needs. The latest modern equipment, skilled organization laboratory tests, careful, frequent inspection, plus a willingness to serve you can mean only one thing —**wire** as you like to have it.

Galvanized, tinned, coppered, liquor finish, annealed, (low, medium, high carbon) manufacturer's wire - - - we'll be glad to work with you on **your** problems.

GK
for uniformity
..quality

Manufacturers of wire for every purpose from paper clips to telephone lines.

KEYSTONE STEEL & WIRE CO.
Peoria, Ill.

Cuppy Wire

(*Continued from page 291*)

milder parts taking up and absorbing part of that where the deformation has been heaviest. Incidentally, locking wires are not drawn to as high a stress as inner cylindrical wires, the greater stress to which they are subjected as an outer layer when passing over a pulley or drum necessitating greater flexibility.

✦ ✦ ✦

Guide Ropes

GUIDE ropes, while free from bending stresses or those generated by travel, are particularly prone to fatigue. This is due to the constant repetition of stresses when steadying the cage which, taking the form of longitudinal oscillations re-act detrimentally on the rope near the top clamp.

✦ ✦ ✦

IT is the frequency of defect at this particular point which makes rope makers so strongly emphasise the necessity of re-capping at frequent intervals in order to avert fatigue failure.

✦ ✦ ✦

Summary

GIVEN efficient heat treatment or normalising, followed by moderate deformation in drafting, high tensile material should be fairly free from defects as mentioned, and while rapid output tends to reduce overhead charges, it should not be overlooked that where this leads to defective production the output ceases to be economic.

✦ ✦ ✦

E. H. Lang, Supt. of Westinghouse Electric Plant At Sharon, Pa.

THE appointment of E. H. Lang, factory superintendent at Sharon, as general superintendent of the Sharon plant, in charge of manufacturing, stores, shipping, maintenance and production has just been announced. Mr. Lang has been with the Westinghouse organization since 1924.

Exports and Imports of Wire

(*Continued from page 280*)

bands', receipts in this classification reaching a total of 1,491 tons, chiefly supplied by Belgium, 748 tons, Germany, 500 tons, and France, 202 tons.

✦ ✦ ✦

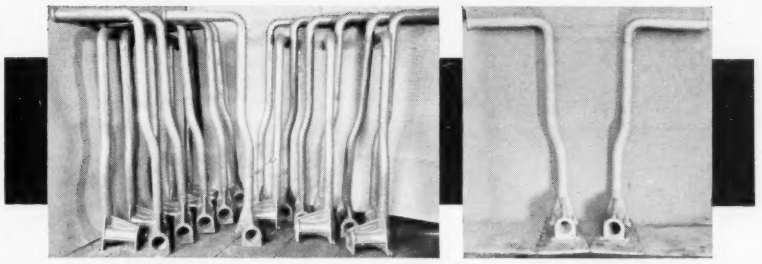
Sources of April Imports

THERE were 14 foreign suppliers which participated in the iron and steel import trade of the United States during March, of which number 7 accounted for 1,000 tons or over. The Netherlands, resuming pig iron shipments, sharply increased its participation by 3,772 tons, while Canada substantially increased its shipments in all items in its trade by 2,283 tons. Receipts from Belgium, Norway, and Sweden followed an upward trend, while decreased shipments were received from Germany and British India.

✦ ✦ ✦

CANADA assumed first ranking as a supplier of iron and steel products to the United States during April (on a tonnage basis) accounting for 6,615 tons made up for the most part of ferromanganese and spiegeleisen, 2,900 tons, pig iron, 2,330 tons, and scrap, 1,228 tons. Shipments from Belgium, the second country of supply, totaled 5,271 tons in a varied trade of which the chief items were structural shapes, 1,760 tons, 'other hoops and bands', 748 tons, merchant and other steel bars, 728 tons, nails, tacks, and staples, 616 tons, and sheets, skelp, and saw plate, 472 tons. Germany came next with participation to the extent of 5,080 tons composed chiefly of nails, tacks, and staples, 1,569 tons, barbed wire, 1,519 tons, 'other hoops and bands', 500 tons, structural shapes, 339 tons, and sheets, skelp, and saw plate, 297 tons. The Netherlands by virtue of its resumption of pig iron shipments ranked fourth, the chief items moving in its trade being pig iron, 3,281 tons, and ferromanganese and spiegeleisen, 626 tons. Norway came next, its total of 2,592 being made up primarily of ferromanganese and spiegeleisen, 1,214 tons, pig iron, 1,100 tons, and steel

(*Please turn to page 296*)



Bend Duriron?

Certainly looks that way, doesn't it?

But, of course, it isn't bent—these bow-legged steam jets were made that way by welding.

This picture shows a few of the many steam jets that are to be used in the continuous sheet pickler of a prominent automobile manufacturer. They are in two different lengths, half of them "rights" and half of them "lefts". The foot piece is set off at an angle of about 10°. A right and a left are placed in opposite corners of the tank. The curve in the riser causes it to lay against the side of the tank, making the full width of the tank available for the sheet.

This illustrates what can be done with Duriron to meet special requirements.

Perhaps Duriron can be adapted to your use—we will be glad to tell you if it can, of course. And by using Duriron you do lower your costs—that's provable.

THE DURIRON COMPANY, Inc.

445 N. Findlay St. DAYTON, OHIO

—DESCO—

A PICKLING STABILIZER ▲ ▲ ▲
FOR CARBON STEELS ▲ ▲ ▲

▲ ▲ ▲

The strong passivating effect of this excellent inhibitor insures a bright finish and forms a sound basis for a bright drawing technique—

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DELANY CHEMICAL CO.

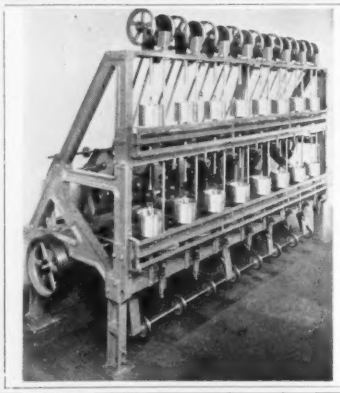
COTTMAN AND MILNOR STS.,
PHILADELPHIA, PA.

Learn about PARALAN

Paralan will give your finished wire and wire products protection from atmospheric corrosion in the mill and in shipping. Paralan-coated wire can be spot welded or soldered without cleaning. Also, Paralan leaves surfaces in good condition for all types of finishes—enameling, japanning, lacquering, plating, etc.

Write for further information. We may be able to solve your difficulties.

AMERICAN LANOLIN CORP.
LAWRENCE, MASSACHUSETTS



Aimco New Wire Insulating Machine

Simple in construction, high speed production, moderate in price, and costs little to operate. Ball bearings throughout, helical gears, and Vee belt spindle drives.

Versatile—applying cotton, silk, paper, cellophane or cellulose acetate tape with equal facility and at high speeds.

Production figures gladly furnished.

EST. 1855 AIMCO INC. 1913
"American" INSULATING MACHINERY COMPANY
REG. U.S. PAT. OFF.
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PHILADELPHIA PENNSYLVANIA U.S.A.

STEELSKIN

REG. U. S. PAT. OFFICE

For High or Low Carbon Wire

WIRE DRAWING SOAPS

Established 30 years

R. H. MILLER CO., Inc. Homer, N.Y.

Patents—Trade Marks

Before disclosing your inventions to anyone send for blank form "Evidence of Conception" and instructions "How to Establish Your Rights".

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Lancaster, Allwine & Rommel

PATENT LAW OFFICES

Suite 438, Bowen Building 815-15th St., N.W. Washington, D. C.

Exports and Imports of Wire

(*Continued from page 295*)

ingots, blooms, etc., 269 tons. Sweden was the seventh supplier of importance its share of 2,362 tons including chiefly wire rods, 898 tons, merchant and other steel bars 316 tons, 'other pipe', 267 tons, flat wire and strip steel, 175 tons, and round iron and steel wire, 175 tons.

✦ ✦ ✦

THE import trade in **card clothing** amounted to 17,174 square feet valued at $23,550, a perceptible drop of 10,835 square feet and $8,580 from March receipts. The countries of supply were Germany, 1,330 square feet valued at $2,515, Switzerland, 20 square feet valued at $209, and the United Kingdom, 15,824 square feet valued at $20,826.

✦ ✦ ✦

WIRE **cloth and screening** imports fell off slightly when the 66,917 square feet received was 3,265 square feet under the total for the previous month. The chief countries of supply were Germany, 30,125 square feet, Canada, 21,591 square feet, and France, 6,658 square feet.

✦ ✦ ✦

FOURDRINIER **and other paper making wire** at 36,299 square feet fell off 6,938 square feet from the March receipts, and came principally from Germany, 22,502 square feet, Austria, 11,878 square feet, and France, 616 square feet.

✦ ✦ ✦

A CONSIDERABLE drop was recorded in **wire heddle** receipts when the 918,000 pieces received declined 576,000 pieces under the March trade, coming from France, 736,000 pieces, and Germany, 182,000 pieces.

✦ ✦ ✦

WIRE **fencing and netting** — galvanized before weaving— receipts at 2,413,475 square feet gained sharply over the March total by 947,150 square feet and was supplied by Germany, 2,126,250 square feet, Belgium, 147,225 square feet, and the Netherlands, 140,000 square feet. Of the galvanized after weaving the total of 828,950 square feet gained 96,502 square feet and originated in Belgium, 681,650 square feet, the Netherlands, 145,500 square feet, and Germany, 1,800 square feet.

(*Please turn to page 297*)

Exports and Imports of Wire

(*Continued from page 296*)

EXPORTS of iron and steel wood screws during April, 1935 totaled 26,602 gross, valued at $3,507. Of this total the Philippine Islands took 7,940 gross valued at $530; Mexico 4,305 gross valued at $908; Cuba 3,000 gross valued at $375; Union of South Africa 2,876 valued at $321; Salvador 2,255 gross valued at $200; Canada 2,197 gross valued at $370; Colombia 1,472 gross valued at $263; Peru 1,163 gross valued at $149.

✦ ✦ ✦

EXPORTS of brass wood screws during the same period totaled 5,322 gross valued at $1,485. Of this amount China took 2,000 gross valued at $507; Panama 792 gross valued at $261; Philippine Islands 615 gross valued at $126; Cuba 415 gross valued at $116; Ecuador 363 gross valued at $144; Mexico 336 gross valued at $75; Bermuda 269 gross valued at $94; Venezuela 252 gross valued at $32.

✦ ✦ ✦

IMPORTS of wood screws during the same period amounted to 28,034 gross valued at $1,845 of which Switzerland supplied 12,675 gross valued at $1,004 and France 10,374 gross valued at $634, while Japan supplied 4,985 gross valued at $207.

✦ ✦ ✦

'Round the World With the Wire Industry

(*Continued from page 287*)

sortium is elaborating plans at the present time for the construction in Turkey of pig and cast steel furnaces and the installation and equipment necessary for the production of steel plates and various standard iron and steel products. It is generally anticipated that during the first few years after their construction these official iron and steel plants will specialize in the production of iron rods for concrete constructions, iron bars, etc., and then somewhat later gradually start production of construction shapes and other materials.

German Wire Rope Exports

THE German wire rope export trade is developing rather satisfactorily. According to a report of the wire rope cartel, February's export was up by 7% compared with January, March 10% better than February and April 6% better than March. The average export prices have improved by about 5%.

✦ ✦ ✦

THIS favorable opinion is not shared by the German wire cartel. The cartel reports that prices on the export market are unsatisfactory and that only the general business volume has been kept up. Total exports of wire vary now between 15,800 and 17,500 tons monthly, but exports of wire nails have fairly improved, the total of March, 2670 tons and in April 2711 tons which is nearly 1000 tons better than March, 1934. It must be taken into consideration that the Saar is now inside Germany, and that Saar exports are between 300 and 400 tons monthly.

Premier
TRADE MARK REG. U.S. PAT. OFF.
Diamond Dies
Reduce Rejects
Give Better Finish
Hold To Size Longer
Cast Straight On Block
DRIVER-HARRIS COMPANY
HARRISON·NEW JERSEY

HIGH SPEED
Welding Wire Straightening and Cutting Machinery
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THE F. B. SHUSTER CO.
New Haven, Conn.
Straightener Specialists Since 1866

EFFICIENT PICKLING
Assured With
RODINE
Rodine saves acid and metal, prevents acid brittleness, and reduces acid fumes.
Samples and complete information sent on request.
AMERICAN CHEMICAL PAINT CO.
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WIRE MILL EQUIPMENT
MORGAN CONSTRUCTION CO.
WORCESTER, MASS.

WANTED
SALESMAN
FOR WIRE DRAWING DIES
ADDRESS BOX 300
c/o Wire & Wire Products

TESTED---
---APPROVED
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"NEP"
100% INHIBITORS
The Wm. M. Parkin Co.
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In Steel Since 1860

WIRE DRAWING MACHINERY AND EQUIPMENT
Rod Frames—16" Frames, 8" Frames —Take-Up Frames, Wire Pointers—Puller Tongs.
General Castings for Wire Mill use.
Circulars on Request.
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PAPER CABLE FILLER
FOLDED PAPER FLATS
PAPER INSULATION YARNS
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ZINC WIRE
THE PLATT BROS. & CO.
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Wire Mill Equipment, Stranding, Insulating, Drawing, Welding
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Subsidiary of
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RUESCH
Machinery For
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Broden Construction Co.
Wire Mill and Cold Rolling Equipment
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Continuous Straightening and Cutting Machinery
With
FLYING SHEAR
for round and shaped wire.
✦ ✦ ✦
THE HALLDEN MACHINE COMPANY
THOMASTON CONNECTICUT

Cable Accessories

AS a companion book to GEA-1731, "How to Make Cable Joints", issued last year, the General Electric Company now has available a new publication, GEA-1839, "Cable Accessories". The two books should be of interest and assistance to everyone who is engaged in work that involves the jointing and terminating of insulated cable.

✦ ✦ ✦

"HOW to Make Cable Joints" gives clear and concise instructions for splicing, jointing, and terminating all types of insulated cable. Its forty-four pages are illustrated with drawings and construction men can easily follow the instructions while on the job.

✦ ✦ ✦

"CABLE Accessories" lists and describes all the materials required for this work—joints, connectors, terminals, reservoirs, and other materials. It has eighty pages and is complete in every respect—including prices. It should prove useful in making up jointing standards and as a general reference book.

✦ ✦ ✦

COPIES of these publications can be obtained from General Electric Company, Dept. 6N-201, Schenectady, New York.

✦ ✦ ✦

Sodium-Zinc Alloy

A SODIUM-ZINC alloy is announced as being developed by the Grasselli Chemical Company, Cleveland, and the R. & H. Chemical division of E. L. DuPont de Nemours & Co., Wilmington, Del.

✦ ✦ ✦

THIS alloy is said to be applicable to all non-ferrous alloys where a content of 2% or more of metallic zinc may be tolerated and is recommended for use as a deoxidizer of brasses. Extensive tests have been conducted at various laboratories and the new alloy is being marketed by the Grasselli Chemical Company, Cleveland, Ohio.

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CONSULTING ENGINEER
Wire Mill Equipment, Layout and Practice
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New York City Worcester, Mass.
Phone: Murray Hill 2-4188 Phone 5-6033

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1924—3 factories, 1800 drills, 300 men, capacity 3000 diamond dies monthly.

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SINCE 1870
Balloffet Diamond Wire Dies Co., Inc.
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TUNGSTEN, DIAMOND, TANTALUM
DIES
KELLY
WIRE DIE CORPORATION
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BISCO
TUNGSTEN CARBIDE DIES
For Wire, Rod and Tubing
Round and Special Shapes
TUNGSTEN ELECTRIC CORP.
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For more complete information, consult the annual Directory, Index & Buyers' Guide.

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ANNEALING FURNACES
See Furnaces—Various Headings

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New England Butt Co., Providence, R. I.
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Morgan Construction Co., Worcester, Mass.
Morrison Engineering Co., Cleveland, O.
Vaughn Machinery Co., Cuyahoga Falls, O.

BORON CARBIDE—
Norton Co., Worcester, Mass.

CEMENTS—Refractory
Norton Co., Worcester, Mass.

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American Chemical Paint Co., Ambler, Pa.
Delany Chemical Co., Tacony Station, Philadelphia, Pa.

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Duriron Co., The, Dayton, O.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

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Borden Construction Co., Cleveland, O.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
H. J. Ruesch Machine Co., Newark, N. J.

CONDUITS—Iron and Steel
Youngstown Sheet & Tube Co., Youngstown, Ohio.

CRANES—Wire Mill
Cleveland Electric Tramrail Div., of Cleveland Crane & Eng. Co., Cleveland, O.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

DIES—Diamond
Balloffet Diamond Wire Dies Co., Inc., N. Y. C.
Cochaud Wire Die Co., New York.
Driver-Harris Co., Harrison, N. J.
Kelly Wire Die Corp., New York, N. Y.
Union Wire Die Corp., New York, N. Y.
Vianney Wire Die Works, New York.

DIES—Lead Extrusion
John Robertson Co., Brooklyn, N. Y.

DIES—Repairs & Re-Cutting
Cochaud Wire Die Corp., New York.
Driver-Harris Co., Harrison, N. J.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Union Wire Die Corp., New York, N. Y.
Vianney Wire Die Wks., N. Y.

DIES—Rod and Tube Drawing
Bissett Steel Co., Cleveland, O.
Carboloy Co., Inc., Newark, N. J.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Union Wire Die Corp., New York, N. Y.
Vianney Wire Die Works, New York, N. Y.

DIES—Tantalum Carbide
Kelly Wire Die Corp., New York, N. Y.
Vanadium-Alloys Steel Co., Chicago, Ill.

DIES—Tungsten Carbide
Carboloy Co., Inc., Newark, N. J.
Driver-Harris Co., Harrison, N. J.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Union Wire Die Corp., New York, N. Y.
Vianney Wire Die Works, New York, N. Y.

DRAW BENCHES
H. J. Ruesch Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.

ENAMELS and LACQUERS—
Ault & Wiborg Corp., Cincinnati, O.

ENGINEER—Consulting Wire Mill
Lewis, Kenneth B., New York, N. Y.

EYELETS—Brass or Zinc
Platt Bros. & Co., The, Waterbury, Conn.

FILLERS—Paper for Cable
E. W. Twitchell, Inc., Phila., Pa.

FURNACES—Annealing
Electric Furnace Co., Salem, O.
Surface Combustion Co., Toledo, O.

FURNACES—Automatic
Electric Furnace Co., Salem, O.
Surface Combustion Co., Toledo, O.

FURNACES—Bright Annealing
Electric Furnace Co., Salem, O.
Surface Combustion Co., Toledo, O.

FURNACES—Electric
Electric Furnace Co., Salem, O.
Surface Combustion Co., Toledo, O.

FURNACES—Lead Melting
Electric Furnace Co., Salem, O.
John Robertson Co., Brooklyn, N. Y.

FURNACES—Non-Oxidizing
Electric Furnace Co., Salem, O.
Surface Combustion Co., Toledo, O.

FURNACES—Wire, Strip and Sheet
Electric Furnace Co., Salem, O.
Surface Combustion Co., Toledo, O.

GEARS—Wire Mill
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Lewis Foundry & Machine Co., Pittsburgh, Pa.

GRINDERS—Roll
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Norton Co., Worcester, Mass.

HANDLING EQUIPMENT—Material
Cleveland Electric Tramrail, Div. of Cleveland Crane & Eng. Co., Wickliffe, O.

HOISTS—
Cleveland Electric Tramrail Div., of Cleveland Crane & Eng. Co., Cleveland, O.

INHIBITORS
American Chemical Paint Co., Ambler, Pa.
Delany Chemical Co., Tacony Station, Philadelphia, Pa.
Parkin Co., The Wm., Pittsburgh, Pa.

INSULATED CABLE LACQUERS and ENAMELS—
Ault & Wiborg Corp., Cincinnati, O.

INSULATION—Cable or Cable Filler
E. W. Twitchell, Inc., Phila., Pa.

LATHES—Die Reaming
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

LIME—Pulverized
Amer. Lime & Stone Co., Bellefonte, Pa.

LUBRICANTS—Wire Drawing
R. H. Miller Co., Homer, N. Y.

MACHINERY—Armoring (Cable, Wire Hose)
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
John Robertson Co., Brooklyn, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Thomson-Gibb Electric Welding Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Braiding
New England Butt. Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Brazing
Thomson-Judd Wire Machinery Co., Lynn, Mass.

MACHINERY—Bunching
Amer. Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Bundling, Scrap
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cable, Electric
American Insulating Machinery Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Thomson-Gibb Electric Welding Co., Lynn, Mass.
Watson Machine Company, Paterson, N. J.

MACHINERY—Chain Making
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Closing
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Coil Winding
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Coilers
Broden Const. Co., Cleveland, O.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
H. J. Ruesch Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester. Mass.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cold Heading With Wire Drawing Attachment
Ajax Manufacturing Co., Cleveland, O.

MACHINERY—Copper Wire Drawing and Rolling
Farrel-Birmingham Co., Inc., Ansonia, Conn.
H. J. Ruesch Machine Co., Newark, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Cutting
Broden Construction Co., Cleveland, O.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Hallden Machine Co., Thomaston, Conn.
F. B. Shuster Co., New Haven, Conn.
Sleeper & Hartley, Worcester, Mass.

MACHINERY—Enameling
American Insulating Mach'y Co., Phila., Pa.

MACHINERY—Extruding
John Robertson Co., Brooklyn, N. Y.
Watson Machine Co., Paterson, N. J.

MACHINERY—Flat Wire
Broden Construction Co., Cleveland, O.
H. J. Ruesch Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Forming
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Galvanizing Wire
Broden Construction Co., Cleveland, O.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Gang Winders
H. J. Ruesch Machine Co., Newark, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding
Norton Co., Worcester, Mass.

MACHINERY—Insulating
American Insulating Machinery Co., Phila.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Lead Encasing Presses, etc.
John Robertson Co., Brooklyn, N. Y.

MACHINERY—Lead Stripping
John Robertson Co., Brooklyn, N. Y.
Watson Machine Co., Paterson, N. J.

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Magnet Wire
American Insulating Mach'y Co., Phila., Pa.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Measuring Wire & Cable
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Nail
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Panning
American Insulating Machinery Co., Phila.

MACHINERY—Pointing
Broden Construction Co., Cleveland, O.
H. J. Ruesch Machine Co., Newark, N. J.
E. J. Scudder Foundry & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

BUYERS' GUIDE, Continued

MACHINERY—Rod Mill
Broden Construction Co., Cleveland, O.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Morgan Const. Co., Worcester, Mass.
H. J. Ruesch Machine Co., Newark, N. J.
Lewis F'dry & Machine Co., Pittsburgh, Pa.

MACHINERY—Rolling Mill
Broden Construction Co., Cleveland, O.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Lewis F'dry & Machine Co., Pittsburgh, Pa.
Morgan Construction Co., Worcester, Mass.
H. J. Ruesch Machine Co., Newark, N. J.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Rubber Strip Covering
Farrel-Birmingham Co., Inc., Ansonia, Conn.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Rubber Tubing and Straining
Farrel-Birmingham Co., Inc., Ansonia, Conn.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Screw Wire
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Special
American Insulating Mach'y Co., Phila. Pa.
Broden Construction Co., Cleveland, O.
H. J. Ruesch Machine Co., Newark, N. J.
E. J. Scudder Foundry and Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Spooling
American Insulating Machinery Co., Phila.
Fidelity Machine Co., Philadelphia, Pa
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Spring Making
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Staple
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Straightening
Broden Construction Co., Cleveland, O.
Hallden Machine Co., Thomaston, Conn.
H. J. Ruesch Machine Co., Newark, N. J.
F. B. Shuster, New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Stranding
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Strip Steel
Broden Const. Co., Cleveland, O.
Lewis F'dry & Machine Co., Pittsburgh, Pa.
H. J. Ruesch Machine Co., Newark, N. J.

MACHINERY—Swaging
H. J. Ruesch Machine Co., Newark, N. J.
Sleeper & Hartley. Worcester, Mass.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Taping
Amer. Insulating Mach. Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Tinsel Rolling Mills
Amer. Insulating Mach'y Co., Phila., Pa.

MACHINERY—Trolley Wire
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill
H. J. Ruesch Machine Co., Newark, N. J.

MACHINERY—Welding Wire
Micro Products Co., Chicago, Ill.
F. B. Shuster Co., New Haven, Conn.
Thomson-Judd Wire Machinery Co., Lynn, Mass.

MACHINERY—Winding
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Drawing
American Insulating Machinery Co., Phila.
Broden Const. Co., Cleveland, Ohio.
Morgan Construction Co., Worcester, Mass.
H. J. Ruesch Machine Co., Newark, N. J.
E. J. Scudder Foundry & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Wire Rope
New England Butt Co., Providence, R. I.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Watson Machine Company, Paterson, N. J.

MACHINERY—Wire Tinning
American Insulating Mach'y Co., Phila., Pa.

MATERIAL HANDLING EQUIPMENT—
Cleveland Electric Tramrail Div., of Cleveland Crane & Eng. Co., Cleveland, O.

PAPER—Insulating
E. W. Twitchell, Inc., Phila., Pa.

PICKLING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Delany Chemical Co., Tacony Station, Philadelphia, Pa.
Parkin Co., The Wm., Pittsburgh, Pa.

PRESSES—Hydraulic and Mechanical
Farrel-Birmingham Co., Inc., Ansonia, Conn.
John Robertson Co., Brooklyn, N. Y.

POTS—Lead Melting
John Robertson Co., Brooklyn, N. Y.

PRESSES—Lead Encasing
John Robertson Co., Brooklyn, N. Y.

PRESSES—Lead Extrusion
John Robertson Co., Brooklyn, N. Y.

PULLERS—Wire
E. J. Scudder Fdry. & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.

PUMPS—Hydraulic
John Robertson Co., Brooklyn, N. Y.

REEL AND TENSION STAND—
Sleeper & Hartley, Inc., Worcester, Mass.

REEL CRUTCHES
Watson Machine Co., Paterson, N. J.

REFRACTORIES—High Temperature
Norton Co., Worcester, Mass.

ROD BAKERS—
Morrison Engineering Co., Cleveland, O.

RODS—Wire—Non Ferrous
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.

RODS—Wire—Steel
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Republic Steel Co., Youngstown, O.
Wheeling Steel Corp., Wheeling, W. Va.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

ROLLING MILLS—See Machinery—Rolling Mill

ROLLS—
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Lewis F'dry & Machine Co., Pittsburgh, Pa.

RUST PROOF COMPOUND
American Lanolin Co., Lawrence, Mass.

SHEET—Steel
Continental Steel Corp., Kokomo, Ind.
Republic Steel Co., Youngstown, O.
Superior Sheet Steel Co., Canton, O.
Wheeling Steel Corp., Wheeling, W. Va.
Youngstown Sheet & Tube Co., Youngstown, O.

SOAPS—Wire Drawing
R. H. Miller Co., Homer, N. Y.

STRIP—Brass, Zinc and Non Ferrous
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.

STRIP—Steel
Continental Steel Corp., Kokomo, Ind.
Driver-Harris Co., Harrison, N. J.
Firth-Sterling Steel Co., McKeesport, Pa.
Republic Steel Co., Youngstown, O.
Wheeling Steel Corp., Wheeling, W. Va.

TANKS—Compound
Watson Machine Co., Paterson, N. J.

TREADS—Safety
Norton Co., Worcester, Mass.

TRUCKS
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

TUBE BENDERS AND FORMERS
H. J. Ruesch Machine Co., Newark, N. J.

VALVES AND FITTINGS—Acid Proof
Duriron Co., The, Dayton, O.

VULCANIZERS
Watson Machine Co., Paterson, N. J.

VULCANIZING PANS
American Insulating Mach'y Co., Phila., Pa.

WIRE—Enameled For Coils
Winsted, Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Manufacturers
Continental Steel Co., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Republic Steel Co., Youngstown, O.
Wheeling Steel Corp., Wheeling, W. Va.
Youngstown Sheet & Tube Co., Youngstown, Ohio

WIRE—Nickel Silver and Phosphor Bronze
Hudson Wire Company, Ossining, N. Y.

WIRE—Non Ferrous to Specification
Hudson Wire Co., Ossining, N. Y.
Winsted, Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Spring
Continental Steel Corp., Kokomo, Ind.
Keystone Steel and Wire Co., Peoria, Ill.
Republic Steel Co., Youngstown, O.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

WIRE—Steel—Also Coppered Steel—Also Galvanized Steel
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Republic Steel Co., Youngstown, O.
Wheeling Steel Corp., Wheeling, W. Va.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

WIRE AND STRIP—Brass, Zinc
Platt Bros. & Co., The, Waterbury, Conn.

This is a carefully classified index of concerns who specialize in this industry and who advertise regularly in WIRE & WIRE PRODUCTS. Please mention WIRE when writing to these firms.

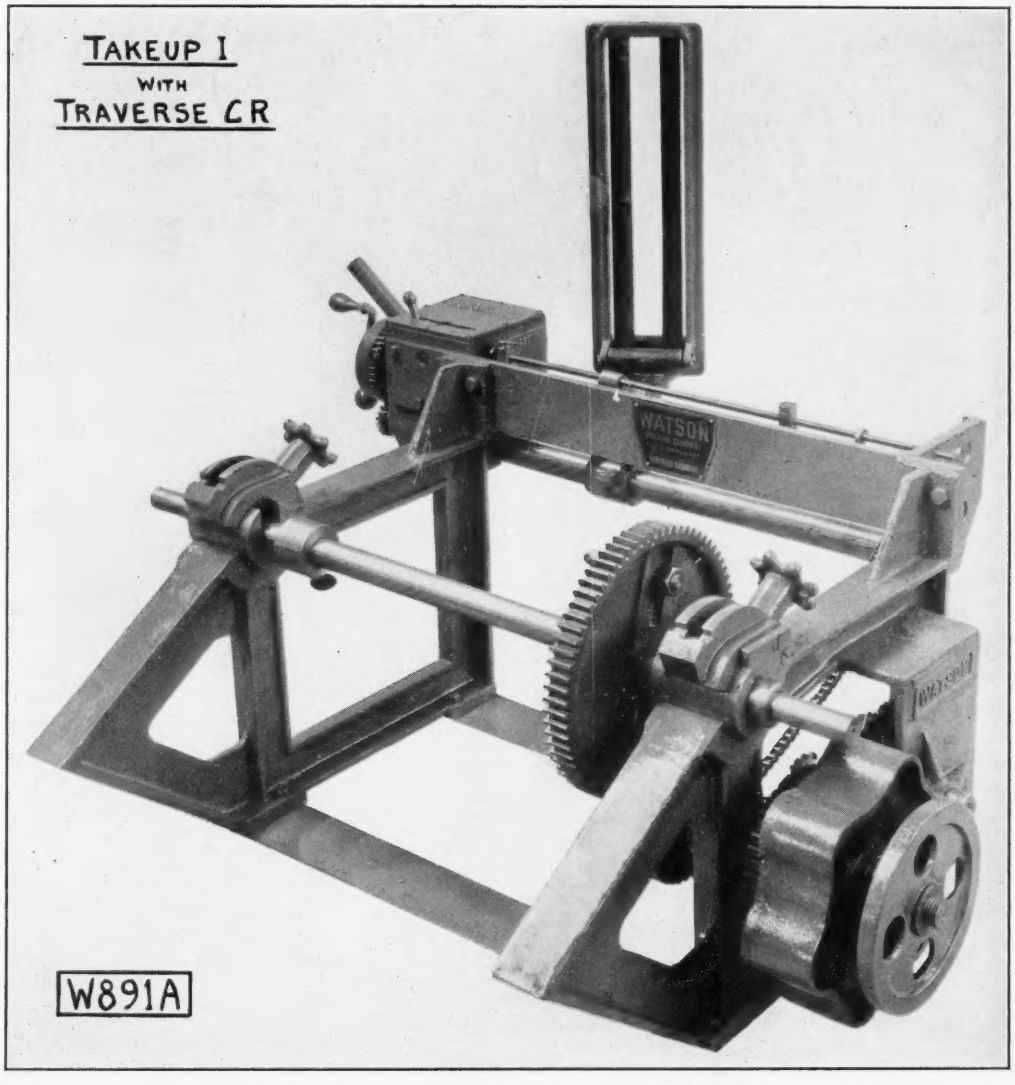
THE WATSON MACHINE COMPANY

ESTABLISHED 1845

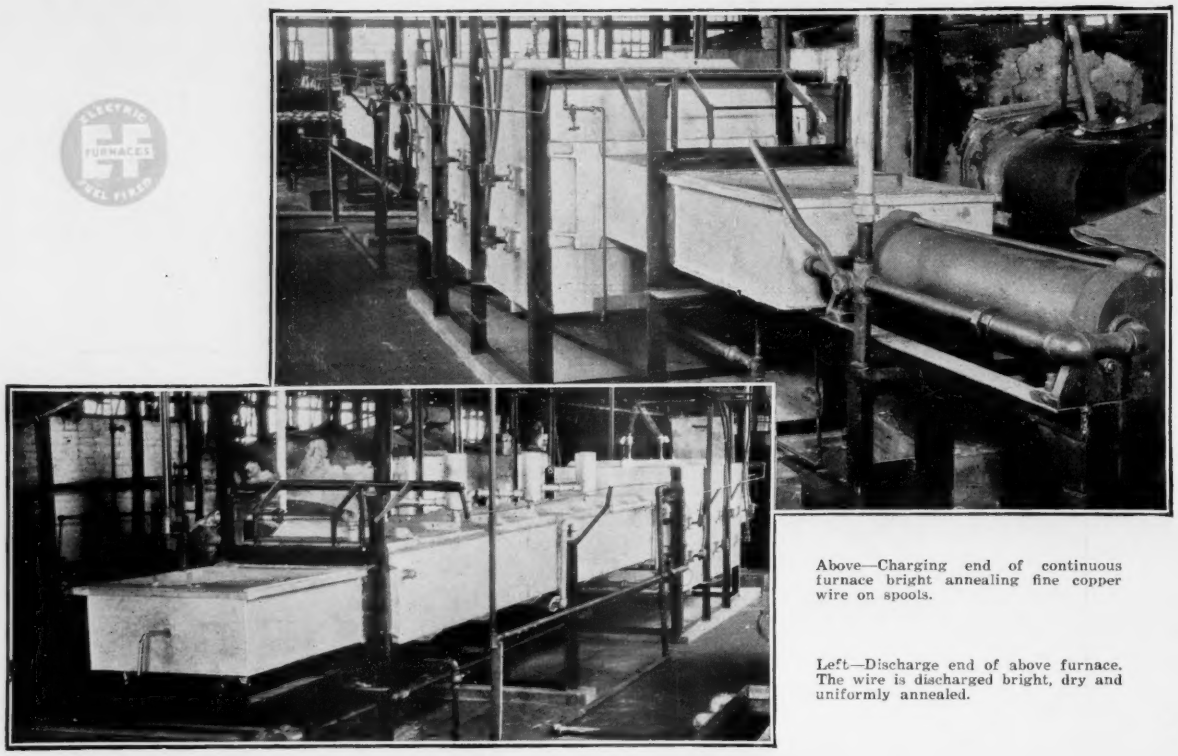
PATERSON, NEW JERSEY, U. S. A.

ENGINEERS - FOUNDERS - MACHINISTS

INCLINE FRAME TAKEUPS Type "I"



Built standard in 30", 42" and 60" sizes.
Sturdy construction for heaviest loads and pulls.
Shaft Drive from Capstan Section.
Multiple Disc Slip Friction.
Reel Shaft Swing Lock has no loose parts.
Automatic Traverse - 16/1 Lay Range (Write for Bulletin).



Above—Charging end of continuous furnace bright annealing fine copper wire on spools.

Left—Discharge end of above furnace. The wire is discharged bright, dry and uniformly annealed.

Bright Annealing Copper Wire

Uniformly, Economically, Continuously,--Bright and Dry

No steam, vapor or water seals of any kind are used in the continuous, controlled atmosphere furnace shown above—thus staining is entirely eliminated and no drying necessary,—the wire is delivered from the furnace uniformly annealed, bright and dry; ready for shipping, further processing or fabricating. This is one of several new types of electric and fuel-fired furnaces we developed and built for the wire industry—both ferrous and non-ferrous.

Other recent installations include furnaces for clean annealing brass wire—an improved pit type furnace for normalizing and annealing steel wire in coils, and furnaces for scale free hardening, billet heating, bright annealing, brazing, carburizing, and other heating and heat treating processes.

If you are interested in improving the quality of your anneal or heat treatment; increasing production or contemplating any changes or additions to your furnace equipment, our engineers will be glad to work with you. We specialize on building furnaces to fit the customer's particular problem.

We Build the Furnace to Fit Your Job---For Oil, Gas or Electric Heat

The Electric Furnace Co., Salem, O.

Head Office and Works of The Electric Furnace Company, Salem, Ohio . . . located on the main line of the P. R. R. . . . the largest plant in the country devoted exclusively to designing and building industrial furnaces and auxiliary equipment.